THE

Mariner's Compaſs RECTIFIED;

Containing TABLES, ſhewing the true Hour of the Day, the Sun being upon any Point of the Compaſs: With the true Time of the *Riſing* and *Setting* of the *Sun* and *Stars*, and the Points of the *Compaſs* upon which they *Riſe* and *Set*: With Tables of *Amplitudes*. Which Tables of Sun-Dials, Semidiurnal-Arches and Amplitudes are calculated from the *Equator* to 60 Degrees of Latitude, either North or South.

With the Deſcription and Uſe of thoſe Inſtruments moſt in Uſe in the Art of NAVIGATION.

Alſo a TABLE of the LATITUDES and LONGITUDES of Places.

By ANDREW WAKELEY, *Mathematician.*

Enlarged with many uſeful Additions, by *J. Atkinſon.*

The Whole reviſed, and carefully corrected, with accurate Tables of the *Sun's Declination*, adjuſted to the *New-Stile.*

By WILLIAM MOUNTAINE, F.R.S

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J: R: Hm: Erly, Castlelake

J. R. Hm E Eardly G.B.T.

Castlelake

-25 April 1848

To the READER.

Courteous READER,

WHEN I firſt entered upon theſe my Labours, and after I had begun the Calculations, I found that tho' the Book would be ſmall, yet my Labour ſo great that I almoſt fainted. Yet at length, when I conſidered the ordinary, neceſſary, and frequent Uſe that might be made of theſe my Labours, I was thereby encouraged to go on and proſecute my Work; and how ready and eaſy I have made it for Practice, will plainly appear (by immediate Inſpection) to the meaneſt Capacity.

Here follows a brief Explanation of the Method and Order of the Book: Firſt, you will find Tables *of the* Sun's Declination, *newly calculated from the beſt Hypotheſis yet diſcovered, and applied to the* Meridian of London, *whoſe* Latitude is 51d. 31m. *North, and* Longitude *according to theſe* Tables 00d. 00m. *Next you will find* Tables *ſhewing the true Hour and Minute of the Day, the* Sun *being upon any Point of the* Compaſs, *which* Tables *are as Dials, fitting all Places in the* World, *whoſe Pole is elevated, not above* 60d. *either North or South: Likewiſe by theſe* Tables *you may know the true* Hour *and* Minute *of the* Night, *by the Bearing of any of the known* Fixed Stars *between the* Tropics: *Then you will find* Tables *ſhewing the true* Time *of the* Sun's Riſing *and* Setting, *with the Length of the* Day *and* Night: *Alſo by theſe* Tables *you may find the true Time of Riſing* *and Setting of all the eminent* Fixed Stars *between the Tropics. Next you will find* Tables *ſhewing the* Points of the Compaſs *that the* Sun, *and all the aboveſaid* Stars *Riſe and Set upon; which* Tables *are of excellent Uſe for readily finding the* Variation of the Compaſs, *and may be performed by a* Meridian Compaſs *that is about ten Inches in* Diameter, *whoſe Points are divided into Halves and Quarters; ſuch a* Compaſs *I ſuppoſe to be convenient for a Mariner's Uſe, where he hath not an* Azimuth Compaſs. *Next you will find* Tables of Amplitudes *to every Degree of the* Sun's Declination: *All theſe* Tables *are calculated from the* Equator *to Sixty Degrees of* Latitude, *either North or South; and they will laſt with Exactneſs as long as* GOD *upholdeth the* Order *and* Courſe *of* Nature.

In the Appendix *you will find the Uſe of all thoſe* Inſtruments *that are moſt in Uſe in the Art of* NAVIGATION, *either for Operation, or Obſervation; Likewiſe a* Table *containing the moſt and chiefeſt Harbours, Headlands, and Iſlands in the* World; *ſhewing the* Latitude *and* Longitude *at each of them; beginning the* Longitude *at the* Meridian *of* London; *the Whole diſpoſed in a new ſucceſſive Order.*

This Method, I own, but how I have acquitted myſelf therein, I ſhall leave to the Judgment and Experiments of the moſt ſkilful Mariners that the World affords, which are my native Countrymen of England.

And now fare ever well, ſo wiſhes he,
Who is more yours, than he can ſeem to be.

ANDREW WAKELEY.

To the PUBLIC.

SIRS,

BEING deſired by the Bookſeller concerned herein, I willingly undertook the Examination of this Treatiſe, (and the rather for that Reſpect I bear to the Memory of my Maſter, the deceaſed Author) which for its Uſefulneſs hath obtained good Eſteem with our NAVIGATORS: I therefore have taken the greater Pains, and ſpent much Time in examining each Table, amending, altering, explaining, and enlarging where I ſaw Cauſe: Having endeavoured to render the Whole of the MARINER's COMPASS RECTIFIED moſt familiar, and eaſy to an ordinary Capacity.

In this Edition I have contracted the *Table of Amplitudes in Points of the Compaſs*, and yet as intelligible as before, by which having made more Room, I have made the *Reader* amends with large Additions in the Uſe of each Table, and methodizing the Diſcourſe throughout; but more eſpecially in the *Uſe of Inſtruments*, I have taken Liberty to Repair, Altar, and Enlarge, that it will appear as good as new; but chiefly in the *Deſcription and Uſe of the Gunter*, *Sliding Gunter*, and *Sector*; principally the two former; whoſe *Uſes* I have ſhewed in *Arithmetic*, to *Multiply*, *Divide*, and work the RULE OF THREE; in *Geometry*, to work *Proportions*, *Continued*, *Duplicate*, and *Triplicate*;

Menſuration of Superficies and *Solids*; as to meaſure *Board*, *Timber*, *Stone*, *Gauging of Veſſels*, *Tunnageing of Ships*, *Bales* or *Boxes*; alſo in *Gunnery*; in *Navigation*, both in *Plane* and *Mercator's Sailing*: In *Aſtronomy*, the moſt uſeful Problems, As to find the Sun's Place, Declination, Riſing, Setting, Amplitude, Azimuth, Hour, and Altitude at all Times. And in all, you are directed plainly to perform them, both by Sliding Gunter, and with Compaſſes.

In the *Table of Latitudes and Longitudes*, I have added many Places of Note, and omitted ſome few that were of little Moment, and have corrected both the Latitudes and Longitudes of the moſt Eminent, according to the lateſt Obſervations: So that I am bold to ſay, it is the moſt exact Table of its Kind extant.

Theſe, with many more *Additions*, through the Whole, I hope will find Acceptance with *Young Students in the Mathematics*, and prove ſerviceable to them, both in the *Study* and *Practice* of NAVIGATION, and other Parts of the MATHEMATICS: For whoſe Sakes I took the greater Pains herein.

JAMES ATKINSON.

EXACT TABLES OF THE SUN's DECLINATION,

Adapted to the Gregorian, *or* New-Stile.

READER,

BY Obſervations made at diſtant Times, Aſtronomers have diſcovered that there is a Receſſion of the Equinoctal Points, which as it makes an Alteration in the Sun's Longitude, *in Reſpect to the ſame Points of Time from Year to Year, ſo it conſequently makes an annual (tho' ſmall) Variation in the* Declination: *And as the* Latitude *at Sea depends ſo much on the Accuracy of thoſe* Tables, *I have with great Exactneſs new calculated the ſame; the* Tables *alſo of* Lat. *and* Long. *at the End of this Book, I have compared with all the various Obſervations I could meet with, and have rectified (with the greateſt Care) whatever I found repugnant to ſuperior Authority.*

WILLIAM MOUNTAINE,

Teacher of the Mathematicks, in Shad-Thames, Southwark. Young Gentlemen Boarded.

Firſt after Leap-Year.

Sun's Declination 1761, 1765, 1769, 1773, 1777.

Days	Jan.		Feb.		March		April		May		June	
	South		South		South		North		North		North	
	D	M	D	M	D	M	D	M	D	M	D	M
1	22	59	16	57	07	24	04	44	15	14	22	09
2	22	54	16	40	07	01	05	07	15	32	22	17
3	22	48	16	22	06	38	05	31	15	50	22	24
4	22	42	16	04	06	14	05	54	16	07	22	31
5	22	35	15	56	05	51	06	17	16	24	22	38
6	22	27	15	27	05	28	06	39	16	41	22	44
7	22	19	15	08	05	05	07	02	16	58	22	50
8	22	11	14	49	04	41	07	24	17	14	22	55
9	22	03	14	30	04	18	07	46	17	30	23	00
10	21	54	14	11	03	54	08	08	17	45	23	05
11	21	45	13	52	03	30	08	30	18	01	23	09
12	21	35	13	32	03	06	08	52	18	16	23	13
13	21	25	13	12	02	42	09	14	18	31	23	17
14	21	15	12	51	02	19	09	35	18	45	23	20
15	21	05	12	30	01	55	09	57	19	00	23	22
16	20	54	12	09	01	32	10	18	19	14	23	24
17	20	42	11	48	01	08	10	39	19	27	23	26
18	20	29	11	27	00	44	11	00	19	40	23	27
19	20	16	11	05	00	21	11	21	19	53	23	28
20	20	02	10	43	Nor.	02	11	41	20	06	23	29
21	19	48	10	22	00	26	12	02	20	18	23	29
22	19	34	10	00	00	50	12	22	20	30	23	29
23	19	20	09	38	01	14	12	42	20	41	23	28
24	19	05	09	16	01	37	13	02	20	52	23	27
25	18	50	08	54	02	01	13	21	21	03	23	25
26	18	35	08	31	02	24	13	40	21	14	23	23
27	18	20	08	09	02	48	14	00	21	24	23	21
28	18	04	07	46	03	11	14	19	21	34	23	18
29	17	48			03	35	14	38	21	43	23	15
30	17	31			03	58	14	56	21	52	23	11
31	17	14			04	21			22	01		

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Firſt after Leap-Year.

Sun's Declination 1761, 1765, 1769, 1773, 1777.

Days	July North		Auguſt North		Sept. North		Octob. South		Nov. South		Decem. South	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
1	23	07	17	58	08	09	03	23	14	37	21	55
2	23	03	17	43	07	47	03	46	14	56	22	04
3	22	59	17	27	07	25	04	09	15	15	22	13
4	22	54	17	11	07	03	04	32	15	34	22	21
5	22	48	16	55	06	41	04	55	15	52	22	29
6	22	42	16	38	06	19	05	18	16	10	22	36
7	22	35	16	21	05	56	05	41	16	28	22	43
8	22	28	16	04	05	33	06	04	16	45	22	49
9	22	21	15	47	05	10	06	27	17	02	22	55
10	22	14	15	29	04	47	06	49	17	19	23	00
11	22	06	15	11	04	24	07	12	17	36	23	05
12	21	58	14	53	04	01	07	35	17	52	23	10
13	21	49	14	35	03	38	07	58	18	08	23	14
14	21	40	14	17	03	15	08	20	18	24	23	17
15	21	31	13	58	02	52	08	42	18	39	23	20
16	21	20	13	39	02	29	09	04	18	54	23	23
17	21	11	13	20	02	06	09	26	19	09	23	25
18	21	00	13	00	01	43	09	48	19	24	23	27
19	20	49	12	41	01	20	10	10	19	38	23	28
20	20	38	12	21	00	56	10	32	19	51	23	29
21	20	27	12	01	00	33	10	54	20	04	23	29
22	20	15	11	41	00	09	11	15	20	17	23	29
23	20	03	11	21	Sou.	14	11	36	20	30	23	28
24	19	50	11	00	00	38	11	57	20	42	23	27
25	19	37	10	39	01	01	12	18	20	54	23	25
26	19	24	10	18	01	25	12	38	21	05	23	23
27	19	10	09	57	01	48	12	59	21	16	23	20
28	18	56	09	36	02	12	13	29	21	26	23	17
29	18	42	09	15	02	36	13	39	21	36	23	14
30	18	28	08	53	03	00.	13	58	21	46	23	10
31	18	13	08	31			14	17			23	06

Second after Leap-Year.

Sun's Declination 1762, 1766, 1770, 1774, 1778.

Days	Jan.		Feb.		March		April		May		June	
	South		South		South		North		North		North	
	D	M	D	M	D	M	D	M	D	M	D	M
1	23	02	17	01	07	28	04	39	15	09	22	06
2	22	56	16	44	07	05	05	02	15	27	22	14
3	22	50	16	26	06	42	05	25	15	45	22	22
4	22	43	16	08	06	19	05	48	16	03	22	29
5	22	36	15	50	05	56	06	11	16	20	22	36
6	22	29	15	32	05	33	06	33	16	37	22	42
7	22	21	15	13	05	10	06	56	16	53	22	48
8	22	13	14	54	04	46	07	18	17	09	22	54
9	22	05	14	35	04	23	07	41	17	25	22	59
10	21	56	14	15	03	59	08	03	17	41	23	04
11	21	47	13	56	03	36	08	25	17	57	23	08
12	21	37	13	36	03	12	08	47	18	12	23	12
13	21	27	13	16	02	49	09	09	18	27	23	15
14	21	16	12	55	02	25	09	30	18	42	23	18
15	21	05	12	34	02	01	09	52	18	56	23	21
16	20	54	12	13	01	37	10	13	19	10	23	23
17	20	42	11	52	01	14	10	34	19	24	23	25
18	20	30	11	31	00	50	10	55	19	37	23	27
19	20	18	11	10	00	26	11	16	19	50	23	28
20	20	05	10	49	00	02	11	37	20	03	23	29
21	19	51	10	27	Nor.	21	11	58	20	15	23	29
22	19	37	10	05	00	44	12	18	20	27	23	29
23	19	23	09	43	01	08	12	37	20	38	23	28
24	19	09	09	21	01	32	12	57	20	49	23	27
25	18	55	08	59	01	56	13	17	21	00	23	26
26	18	40	08	37	02	19	13	36	21	11	23	24
27	18	24	08	14	02	43	13	55	21	21	23	22
28	18	08	07	51	03	06	14	14	21	31	23	19
29	17	52			03	30	14	33	21	40	23	16
30	17	36			03	53	14	51	21	49	23	13
31	17	19			04	16			21	58		

Second after Leap-Year.

Sun's Declination 1762, 1766, 1770, 1774, 1778.

Days	July		Auguſt		Sept.		Octob.		Nov.		Decem.	
	North		North		North		South		South		South	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
1	23	09	18	01	08	14	03	16	14	32	21	53
2	23	04	17	46	07	52	03	39	14	51	22	02
3	22	59	17	30	07	30	04	03	15	10	22	11
4	22	54	17	14	07	08	04	26	15	29	22	19
5	22	49	16	58	06	46	04	49	15	47	22	27
6	22	43	16	42	06	24	05	12	16	05	22	34
7	22	37	16	25	06	01	05	35	16	23	22	41
8	22	30	16	08	05	38	05	58	16	41	22	47
9	22	23	15	51	05	16	06	21	16	58	22	53
10	22	16	15	33	04	53	06	44	17	15	22	59
11	22	08	15	16	04	30	07	07	17	32	23	04
12	22	00	14	58	04	07	07	30	17	48	23	09
13	21	51	14	40	03	44	07	53	18	04	23	13
14	21	42	14	21	03	21	08	15	18	20	23	16
15	21	33	14	02	02	58	08	37	18	35	23	19
16	21	23	13	43	02	35	08	59	18	50	23	22
17	21	13	13	24	02	11	09	21	19	05	23	24
18	21	03	13	05	01	47	09	43	19	20	23	26
19	20	52	12	45	01	24	10	05	19	34	23	27
20	20	41	12	25	01	01	10	27	19	48	23	28
21	20	29	12	05	00	38	10	48	20	01	23	29
22	20	17	11	45	00	14	11	09	20	14	23	29
23	20	05	11	25	Son.	09	11	30	20	27	23	28
24	19	53	11	05	00	32	11	51	20	39	23	27
25	19	40	10	44	00	56	12	12	20	51	23	25
26	19	27	10	23	01	19	12	33	21	02	23	23
27	19	14	10	02	01	43	12	53	21	13	23	21
28	19	00	09	41	02	06	13	13	21	24	23	18
29	18	46	09	20	02	29	13	33	21	34	23	14
30	18	31	08	58	02	52	13	53	21	44	23	10
31	18	16	08	36			14	13			23	06

Third after Year.

Sun's Declination 1763, 1767, 1771, 1775, 1779.

Days	Jan.		Feb.		March		April		May		June	
	South		South		South		North		North		North	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
1	23	02	17	05	07	34	04	33	15	05	22	04
2	22	57	16	48	07	11	04	56	15	23	22	12
3	22	51	16	31	06	48	05	19	15	41	22	20
4	22	45	16	13	06	25	05	42	15	59	22	28
5	22	38	15	55	06	02	06	05	16	16	22	35
6	22	31	15	36	05	39	06	28	16	33	22	41
7	22	23	15	18	05	16	06	51	16	50	22	47
8	22	15	14	59	04	52	07	13	17	06	22	53
9	22	07	14	40	04	29	07	35	17	22	22	58
10	21	59	14	20	04	05	07	57	17	38	23	03
11	21	30	14	00	03	42	08	20	17	54	23	07
12	21	40	13	40	03	18	08	42	18	09	23	11
13	21	30	13	20	02	55	09	04	18	24	23	14
14	21	19	13	00	02	31	09	25	18	38	23	17
15	21	08	12	40	02	07	09	47	18	53	23	20
16	20	57	12	19	01	43	10	08	19	07	23	23
17	20	45	11	58	01	20	10	29	19	20	23	25
18	20	33	11	37	00	56	10	50	19	33	23	27
19	20	20	11	16	00	33	11	11	19	46	23	28
20	20	07	10	54	00	09	11	31	19	59	23	29
21	19	54	10	32	Nor.	14	11	52	20	12	23	29
22	19	40	10	10	00	38	12	12	20	24	23	29
23	19	26	09	48	01	02	12	32	20	36	23	28
24	19	12	09	26	01	26	12	52	20	47	23	27
25	18	58	09	04	01	50	13	12	20	58	23	26
26	18	43	08	42	02	13	13	31	21	99	23	24
27	18	27	08	20	02	37	13	50	21	19	23	22
28	18	11	07	57	03	00	14	09	21	29	23	20
29	17	55			03	24	14	28	21	39	23	17
30	17	39			03	47	14	47	21	48	23	13
31	17	22			04	10			21	56		

Third after Leap-Year.

Sun's Declination 1763, 1767, 1771, 1775, 1779.

Days	July		Auguſt		Sept.		Octob.		Nov.		Decem.	
	North		North		North		South		South		South	
	D	M	D	M	D	M	D	M	D	M	D	M
1	23	09	18	05	08	20	03	10	14	27	21	51
2	23	05	17	50	07	58	03	34	14	47	22	00
3	23	01	17	34	07	36	03	57	15	06	22	09
4	22	56	17	18	07	13	04	20	15	25	22	17
5	22	51	17	02	06	51	04	44	15	43	22	25
6	22	45	16	46	06	29	05	07	16	01	22	32
7	22	39	16	29	06	07	05	30	16	19	22	39
8	22	32	16	12	05	44	05	53	16	37	22	46
9	22	25	15	55	05	22	06	16	16	54	22	52
10	22	18	15	38	04	59	06	39	17	11	22	58
11	22	10	15	20	04	36	07	02	17	28	23	03
12	22	02	15	02	04	13	07	25	17	44	23	08
13	21	53	14	44	03	50	07	48	18	00	23	12
14	21	44	14	26	03	27	08	10	18	16	23	16
15	21	35	14	07	03	04	08	32	18	32	23	19
16	21	26	13	48	02	40	08	54	18	47	23	22
17	21	16	13	29	02	17	09	16	19	02	23	24
18	21	05	13	10	01	53	09	38	19	16	23	26
19	20	54	12	50	01	30	10	00	19	30	23	28
20	20	43	12	30	01	07	10	22	19	44	23	29
21	20	32	12	10	00	44	10	43	19	58	23	29
22	20	20	11	51	00	20	11	04	20	11	23	29
23	20	08	11	30	Sou	03	11	25	20	24	23	28
24	19	56	11	09	00	26	11	46	20	36	23	27
25	19	43	10	49	00	50	12	07	20	48	23	26
26	19	30	10	28	01	13	12	28	20	59	23	24
27	19	17	10	07	01	37	12	49	21	10	23	22
28	19	03	09	46	02	00	13	09	21	21	23	19
29	18	49	09	25	02	23	13	29	21	31	23	16
30	18	35	09	04	02	46	13	49	21	41	23	12
31	18	20	08	42			14	08			23	08

Leap-Year.

Sun's Declination 1764, 1768, 1772, 1776, 1780.

Days	Jan.		Feb.		March		April		May		June	
	South		South		South		North		North		North	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
1	23	03	17	09	07	16	04	50	15	19	22	10
2	22	57	16	52	06	53	05	13	15	37	22	18
3	22	51	16	35	06	30	05	36	15	54	22	25
4	22	45	16	17	06	07	05	59	16	11	22	32
5	22	39	15	59	05	44	06	22	16	28	22	39
6	22	33	15	41	05	21	06	45	16	45	22	45
7	22	26	15	23	04	58	07	08	17	02	22	51
8	22	18	15	04	04	34	07	30	17	18	22	56
9	22	10	14	45	04	11	07	52	17	34	23	01
10	22	01	14	25	03	47	08	14	17	50	23	06
11	21	52	14	05	03	24	08	36	18	05	23	10
12	21	42	13	45	03	00	08	58	18	20	23	13
13	21	32	13	25	02	37	09	20	18	35	23	17
14	21	22	13	05	02	13	09	42	18	49	23	20
15	21	11	12	45	01	49	10	03	19	03	23	23
16	21	00	12	24	01	25	10	24	19	17	23	25
17	20	48	12	03	01	01	10	45	19	31	23	27
18	20	36	11	42	00	38	11	06	19	44	23	28
19	20	23	11	21	00	14	11	27	19	57	23	29
20	20	10	10	59	Nor.	09	11	47	20	09	23	29
21	19	57	10	38	00	33	12	07	20	21	23	29
22	19	44	10	16	00	56	12	27	20	33	23	29
23	19	30	09	54	01	20	12	47	20	44	23	28
24	19	16	09	31	01	44	13	07	20	55	23	27
25	19	01	09	09	02	08	13	27	21	06	23	25
26	18	46	08	47	02	31	13	46	21	16	23	23
27	18	31	08	25	02	54	14	05	21	26	23	20
28	18	15	08	02	03	17	14	24	21	36	23	17
29	17	59	07	39	03	41	14	43	21	45	23	14
30	17	43			04	04	15	01	21	54	23	11
31	17	26			04	27			22	02		

Leap-Year.

Sun's Declination 1764, 1768, 1772, 1776, 1780.

Days	July		Auguſt		Sept.		Octob.		Nov.		Decem.	
	North		North		North		South		South		South	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
1	23	07	17	53	08	03	03	28	14	42	21	58
2	23	02	17	38	07	41	03	52	15	01	22	07
3	22	57	17	22	07	19	04	15	15	20	22	15
4	22	52	17	06	06	57	04	38	15	39	22	23
5	22	46	16	50	06	35	05	01	15	57	22	31
6	22	40	16	33	06	12	05	24	16	15	22	38
7	22	34	16	16	05	50	05	47	16	33	22	45
8	22	27	15	59	05	27	06	10	16	50	22	51
9	22	20	15	42	05	04	06	33	17	07	22	56
10	22	12	15	24	04	41	06	56	17	24	23	01
11	22	04	15	06	04	18	07	19	17	40	23	06
12	21	55	14	48	03	55	07	42	17	56	23	10
13	21	46	14	30	03	32	08	04	18	12	23	14
14	21	37	14	11	03	09	08	26	18	28	23	18
15	21	28	13	53	02	46	08	48	18	43	23	21
16	21	18	13	34	02	23	09	10	18	58	23	23
17	21	08	13	15	02	00	09	32	19	13	23	25
18	20	57	12	55	01	36	09	54	19	27	23	27
19	20	46	12	36	01	13	10	16	19	41	23	28
20	20	35	12	16	00	49	10	38	19	54	23	29
21	20	24	11	56	00	26	10	59	20	07	23	29
22	20	12	11	35	00	02	11	20	20	20	23	29
23	19	59	11	15	Sou.	21	11	41	20	32	23	28
24	19	46	10	54	00	44	12	02	20	44	23	26
25	19	33	10	33	01	08	12	23	20	56	23	24
26	19	20	10	12	01	31	12	44	21	08	23	22
27	19	06	09	51	01	55	13	04	21	19	23	20
28	18	52	09	30	02	18	13	24	21	30	23	17
29	18	38	19	09	02	41	13	44	21	40	23	13
30	18	23	08	47	03	05	14	04	21	49	23	09
31	18	08	08	25			14	23			23	04

A Deſcription *of the* TABLES *of the* SUN'S DECLINATION.

THESE Tables are in general for Four Years; Leap-Year, Firſt, Second and Third Year after Leap-Year, and conſequently for any Year.

Each Year (taking up two Pages) hath the firſt Six Months of the Year on the Left-hand Page, and the laſt ſix Months are on the Right-hand Page, the Names of the Months are at the Head of each Column, and the Days of each Month in the Left-hand Column of each Page.

The firſt Table ſheweth the Sun's Declination every Day for the firſt Years after Leap-Year, being 1761, 1765, 1769, 1773, 1777, *&c.* and takes up Pages (10 and 11:) The ſecond Table is for 1762, 1766, 1770, 1774, 1778, *&c.* being Second Years after Leap-Year, in Pages (12) and (13): The next Table in Pages (14) and (15) is for the Third Years after Leap-Year: The Fourth Table in Pages (16) and (17) ſheweth the Sun's Declination for Leap-Years, being 1764, 1768, 1772, 1776, 1780, *&c.*

Under the Name of the Month, is the Name of the Declination either North or South, only the Column for *March* and *September*, hath two Names; that is, under *March* is South, and againſt the 21ſt and 20th Day (according as it is Leap-Year, or 1ſt, 2d, 3d Year after) is *Nor.* for North; and under *September* is North, and againſt the 23d, or 24th Day is *Sou.* for South; intimating the Declination is South in *March*, till the 21ſt or 20th Day, and all the remaining Part of the Month it's *Nor.* or North; In like manner in *September*, it's North till the 23d or 24th Day, from thence to the Month's end it's *Sou.* or South.

The

The Uſe of the Tables *of* Declination.

TO find the Sun's Declination for any Day in any Year, is after this manner.

1. Seek the Year and Month, at the Head of the Table; and the Day of the Month in the Left-hand Column.

2. Then right under the Month, at the Head of the Table, and againſt the Day of the Month in the Left-hand Column, is the Sun's Declination required.

Example 1. I deſire to know the Sun's Declination for the 24th Day of *April*, 1762.

The Year 1762, is the ſecond Year after Leap-Year, which is in Page (12): then under *April*, and againſt 24 (under Days) is 12.57, with North at the Head of the Table under *April*; which ſheweth the Sun's Declination on the 24th of *April*, 1762, is 12d. 57m. North.

Example 2. What is the Sun's Declination for the 21ſt of *March*, 1764.

The Year 1764 being Leap-Year, is found in Page 16; then againſt the 21ſt Day, and under *March*, is *Nor*. 0.33; ſignifying the Sun's Declination at that Time is 00d. 33m. North; the like do for any othe Time.

A Table to Proportion the Sun's Declination *to any other Meridian.*

Eaſt Weſt } Long. with Dec. { Incr. Decr. } Subt. } but Decl. { Decr. Incr. } add	Degrees of Longitude.	*The Daily Difference in Declination.*											
		m	m	m	m	m	m	m	m	m	m	m	m
		2	4	6	8	10	12	14	16	18	20	22	24
		m	m	m	m	m	m	m	m	m	m	m	m
	15	0	0	0	0	0	0	1	1	1	1	1	1
	30	0	0	0	1	1	1	1	1	1	2	2	2
	45	0	0	1	1	1	1	2	2	2	2	3	3
	60	0	1	1	1	2	2	2	3	3	3	4	4
	75	0	1	1	2	2	2	3	3	4	4	5	5
	90	0	1	1	2	2	3	3	4	4	5	5	6
	105	1	1	2	2	3	3	4	5	5	6	6	7
	120	1	1	2	3	3	4	5	5	6	7	7	8
	135	1	1	2	3	4	4	5	6	7	7	8	9
	150	1	2	2	3	4	5	6	7	7	8	9	10
	165	1	2	3	4	5	5	6	7	8	9	10	11
	180	1	2	3	4	5	6	7	8	9	10	11	12

The Uſe of this TABLE of Proportion.

THE Tables of the Sun's Declination are calculated for the Meridian of *London*, and will ſerve for any Place under that Meridian; but for thoſe Places ſituate Eaſterly or Weſterly from it, the Declination muſt be proportioned according to its daily Difference in the Table, and Longitude of thoſe Places from the Meridian of *London*; for which Purpoſe this Table is uſed, as is evident by theſe Examples following.

Example

Example 1.

Admit the 10th Day of *April*, *Anno* 1764. I am in Longitude 105d. Eaſt; I demand what Declination the Sun will have that Day in the Meridian of that Place?

The Declination for *April* the 10th, in the Meridian of *London* is 08d. 14m. increaſing, and the daily Difference at that Time, is 22m. therefore in this Table look in the Head thereof for the Number 22, or neareſt thereunto, if not in the Table; then look on the Left-hand of the Table for 105d. (or the neareſt thereto) the Longitude I am in, and in the common Angle of meeting is 6 min. which is to be deducted from the Declination in the Meridian of *London* aforeſaid 8d. 14m. and the Remainder will be the Declination for that Meridian, or the Longitude I am in, which is 08d. 08m. North. But if the Declination had decreaſed, as it doth here increaſe, then you muſt have added, as hereunder you may ſee.

	d.		m.	
The Declination in the Meridian of *London* is	08	:	14	N
The Proportional Minutes ſubtract - - - - --	00	:	06	
The Decl. for the Longitude of 105d. Eaſt is	08	:	08	N
The Decl. for the Longitude of 105d. Weſt is	08	:	20	N

Example 2.

Admit the 10th Day of *October*, *Anno* 1766. I am in Longitude 87 deg. Weſt: I demand what Declination the Sun will have that Day in that Meridian?

The daily Difference in the Table of Declination, at this Time is 23m. and the Proportional Part thereof by the laſt Table is 5 min. increaſing.

	d.		m.	
The Declination in the Meridian of *London* —	06	:	44	S
The Proportional Minutes add - - - - - - - - -	00	:	05	
The Declination in the Long. of 87d. Weſt is	06	:	49	S
The Declination for the Long. of 87d. Eaſt is	06	:	39	S

A TABLE of Refraction deduced from Mr. Flamſtead's *Obſervations, made at the* Royal Obſervatory *at* Greenwich.

Altitudes	Refractions	Altitudes	Refractions	Altitudes	Refractions	Altitudes	Refractions
D.	M.S.	D.	M. S.	D.	M.S.	D.	M.S.
00	23.00	10	4.33	25	1.45	40	0.58
00½	26.38	11	4.06	26	1.40	41	0.56
01	23.22	12	3.45	27	1.36	42	0.54
02½	20.17	13	3.29	28	1.31	43	0.52
02	17.26	14	3.13	29	1.27	44	0.50
02½	15.15	15	3.00	30	1.23	45	0.48
03	13.23	16	2.48	31	1.20	46	0.46
03½	11.53	17	2.38	32	1.17	47	0.45
04	10.39	18	2.29	33	1.14	48	0.44
04½	9.38	19	2.21	34	1.11	49	0.42
05	8.48	20	2.14	35	1.09	50	0.40
06	7.26	21	2.07	36	1.07	55	0.34
07	6.25	22	2.01	37	1.05	60	0.29
08	5.37	23	1.55	38	1.02	70	0.19
09	5.02	24	1.50	39	1.00	80	0.09
10	4.33	25	1.45	40	0.58	90	0.00

The Refraction of the Sun, Moon and Stars, cauſeth them to appear higher above the Horizon than they are; therefore the Refraction is always to be ſubtracted from the Altitude obſerved, that the true Altitude may be had.

As, admit the Sun's Meridian Altitude, by Obſervation, to be 5 Degrees; I demand the true Altitude?

	d.		m.
Altitude by Obſervation being - - -	05	:	00
Sun's Refraction 8m. 48ſ. ſubtract - -	00	:	09
The Sun's true Meridian Altitude is - -	04	:	51

Primum

PRIMUM MOBILE:

O R,

Aſtronomic Tables;

Each TABLE being

A SUN-DIAL,

SHEWING

The Exact Hour of the Day, the Sun being upon any Point of the Compaſs; fitting all Places upon the Earth and Sea, that lie between the Equator and 60 Degrees of Latitude, either North or South: And to laſt with Exactneſs as long as the Omnipotent and Everlaſting Creator ſhall be pleaſed to conſerve the Great and Wonderful Fabric of Nature.

A Sun-Dial for the Latitude of 0 Degree.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
North	12	12	12	12	12	12	12	12	12	12	12
n by w	Zen. Weſt	0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.17	0 19	0.20
n n w		0.04	0.08	0.12	0.17	0.21	0.25	0.30	0.35	0.39	0.41
nw by n		0.07	0.13	0.20	0.27	0.34	0.41	0.49	0.56	1.03	1.07
n w		0.10	0.20	0.30	0.41	0.51	1.02	1.14	1.25	1.35	1.43
nw by w		0.15	0.30	0.45	1.01	1.18	1.35	1.53	2.12	2.29	2.42
w n w		0.24	0.49	1.14	1.41	2.09	2.41	3.18	4.06	5.11	
w by n		0.51	1.44	2.46	4.10						
Weſt											
☉ ſet	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
Sun's Ampl.	d m 0.00	d m 2.30	d m 5.00	d m 7.30	d m 10.0	d m 12.30	d m 15.0	d m 17.30	d m 20.0	d m 22.0	d m 23.29

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	Zen. Weſt	0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.17	0.19	0.20
s s w		0.04	0.08	0.12	0.17	0.21	0.25	0.30	0.35	0.39	0.41
sw by s		0.07	0.13	0.20	0.27	0.34	0.41	0.49	0.56	1.03	1.07
s w		0.10	0.20	0.30	0.41	0.51	1.02	1.14	1 25	1.35	1.43
sw by w		0.15	0.30	0.45	1.01	1.18	1.35	1.53	2.12	2.29	2.42
w s w		0.24	0.49	1.14	1.41	2.09	2.41	3.18	4.06	5.11	
w by s		0.51	1.44	2.46	4.10						
Weſt											
☉ ſet	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00

A Sun-Dial for the Latitude of 1 Degree.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
North	12	12	12	12	12	12	12	12	12	12	12
n by w	Zen. Weſt	0.01	0.03	0.05	0.07	0.09	0.11	0.14	0.16	0.18	0.19
n n w		0.02	0.06	0.10	0.15	0.19	0.23	0.27	0.32	0.36	0.38
nw by n		0.04	0.11	0.17	0.24	0.31	0.38	0.46	0.53	1.00	1.04
n w		0.06	0.16	0.26	0.37	0.47	0.58	1.09	1.21	1.31	1.39
nw by w		0.09	0.24	0.39	0.56	1.12	1.29	1.47	2.06	2.21	2.35
w n w		0.14	0.39	1.04	1.31	1.59	2.30	3.07	3.54	4.53	
w by n		0.30	1.24	2.25	3.48						
Weſt	6.00										
⊙ ſet	6.00	6.00	6.00	6.00	6.01	6.01	6.01	6.01	6.01	6.02	6.02
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Ampl.	0.00	2.30	5.00	7.30	10.0	12.30	15.0	17.30	20.0	22.0	23.29

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.01	0.03	0.05	0.07	0.09	0.11	0.13	0.15	0.17	0.19	0.21
s s w	0.02	0.06	0.10	0.14	0.18	0.22	0.26	0.31	0.35	0.39	0.42
sw by s	0.03	0.09	0.16	0.23	0.30	0.37	0.44	0.51	0.59	1.05	1.10
s w	0.04	0.14	0.24	0.34	0.45	0.55	1.06	1.17	1.29	1.39	1.47
sw by w	0.06	0.21	0.36	0.51	1.07	1.23	1.40	1.57	2.17	2.31	2.46
w s w	0.10	0.34	0.58	1.23	1.50	2.18	2.50	3.26	4.13	5.13	
w by s	0.20	1.11	2.04	3.05	4.28						
Weſt	6.00										
⊙ ſet	6.00	6.00	6.00	6.00	5.59	5.59	5.59	5.59	5.59	5.58	5.58

A Sun-Dial for the Latitude of 2 Degrees.

NORTH DECLINATION.

0 d	Deg. Min.	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
h m	Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
12	North	12	12	12	12	12	12	12	12	12	12
0.02	n by w	Zen. West.	0.02	0.04	0.06	0.09	0.11	0.13	0.15	0.17	0.18
0.03	n n w		0.05	0.09	0.13	0.18	0.22	0.27	0.32	0.35	0.38
0.05	nw by n		0.08	0.15	0.22	0.29	0.36	0.44	0.51	0.57	1.02
0.08	n w		0.12	0.22	0.33	0.43	0.54	1 05	1.17	1.27	1.34
0.12	nw by w		0.18	0.33	0.49	1.05	1.22	1.40	2.00	2.16	2.29
0.20	w n w		0.29	0.53	1.21	1.50	2.21	2.58	3.45	4.46	
0.40	w by n		1.03	2.03	3.23						
6.00	Weſt										
6.00	⊙ ſet	6.00	6.00	6.00	6.01	6.02	6.02	6.02	6.03	6.03	6.04
d m	Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
0.00	Ampl.	2.30	5.00	7.30	10.0	12.30	15.0	17.31	20.1	22.1	23.30

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.16	0.18	0.20	0.22
s s w	0.03	0.07	0.12	0.16	0.20	0.25	0.29	0.34	0.38	0.42	0.45
sw by s	0.05	0.12	0.19	0.25	0.32	0.39	0.46	0.54	1.01	1.08	1.12
s w	0.08	0.18	0.28	0.38	0.48	0.59	1.10	1.21	1.33	1.42	1.50
sw by w	0.12	0.27	0.42	0.57	1.13	1.29	1.46	2.04	2.23	2.40	2.53
w s w	0.20	0.43	1.08	1.33	2.00	2.28	3.00	3.36	4.24	5.24	
w by s	0.40	1.30	2.22	3.22	4.43						
Weſt	6.00										
⊙ ſet	6.00	6.00	6.00	5.59	5.59	5.58	5.58	5.58	5.57	5.57	5.56

A Sun-Dial for the Latitude of 3 Degrees.

NORTH DECLINATION.

0 d	Deg. Min.	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
m	Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
12	North	12	12	12	12	12	12	12	12	12	12
0.02	n by w	Zen. West.	0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.16	0.17
0.05	n n w		0.03	0.07	0.12	0.16	0.20	0.25	0.29	0.33	0.36
0.08	nw by n		0.05	0.12	0.19	0.26	0.33	0.40	0.48	0.54	0. 9
0.12	n w		0.08	0.18	0.29	0.39	0.50	1.01	1.13	1.23	1.31
0.18	nw by w		0.12	0.27	0.43	0.59	1.16	1.34	1.54	2.10	2.24
0.29	w n w		0.20	0.45	1.11	1.39	2.11	2.47	3.33	4.33	
0.59	w by n		0.42	1.40	2.57						
6.00	Weſt										
6.00	⊙ ſet	6.00	6.00	6.01	6.02	6.02	6.03	6.04	6.04	6.05	6.05
d m	Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
0.00	Ampl.	2.30	5.00	7.30	10.1	12.31	15.1	17.31	20.2	22.2	23.32

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.02	0.05	0.07	0.09	0.11	0.13	0.15	0.17	0.19	0.21	0.22
s s w	0.05	0.09	0.13	0.18	0.22	0.26	0.31	0.35	0.40	0.44	0.47
sw by s	0.08	0.15	0.21	0.28	0.35	0.42	0.49	0.56	1.04	1.10	1.15
s w	0.12	0.22	0.32	0.42	0.53	1.03	1.14	1.25	1.37	1.47	1.55
sw by w	0.18	0.33	0.48	1.03	1.19	1.35	1.52	2.10	2.30	2.45	3.00
w s w	0.29	0.53	1.17	1.42	2.09	2.37	3.09	3.45	4.32	5.31	
w by s	0.59	1.48	2.40	3.38	4.55						
Weſt	6.00										
⊙ ſet	6.00	6.00	6.00	5.59	5.58	5.58	5.57	5.56	5.56	5.55	5.55

A Sun-Dial for the Latitude of 4 Degrees.

NORTH DECLINATION.

Deg. Min.	2 d 30m	Deg. Min.	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	Point	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	North	12	12	12	12	12	12	12	12	12
s by w	0.01	n by w	0.01	0.03	0.05	0.07	0.09	0.11	0.13	0.15	0.17
s s w	0.02	n n w	0.02	0.06	0.10	0.14	0.19	0.23	0.28	0.32	0.35
sw by s	0.04	nw by n	0.03	0.09	0.16	0.23	0.30	0.38	0.45	0.52	0.57
s w	0.06	n w	0.04	0.14	0.24	0.35	0.46	0.57	1.09	1.19	1.27
sw byw	0.09	nw byw	0.06	0.21	0.37	0.53	1.10	1.28	1.47	2.04	2.17
w s w	0.14	w n w	0.10	0.35	1.01	1.29	2.00	2.36	3.21	4.17	
w by s	0.29	w by n	0.21	1.17	2.29						
Weſt	3.25	Weſt									
☉ ſet	6.00	☉ ſet	6.01	6.02	6.03	6.03	6.04	6.05	6.06	6.06	6.07
Sun's Ampl.	d m 2.30	Sun's Ampl.	d m 5.00	d m 7.31	d m 10.1	d m 12.31	d m 15.2	d m 17.32	d m 20.3	d m 22.3	d m 23.33

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.03	0.05	0.07	0.09	0.11	0.13	0.16	0.18	0.20	0.22	0.23
s s w	0.07	0.11	0.15	0.19	0.23	0.28	0.32	0.36	0.41	0.45	0.48
sw by s	0.11	0.17	0.24	0.31	0.38	0.45	0.52	0.59	1.07	1.13	1.18
s w	0.16	0.26	0.36	0.46	0.56	1.07	1.18	1.29	1.41	1.51	1.58
sw by w	0.24	0.39	0.54	1.09	1.25	1.41	1.58	2.15	2.35	2.51	3.04
w s w	0.38	1.02	1.26	1.51	2.17	2.45	3.17	3.52	4.38	5.33	
w by s	1.17	2.05	2.55	3.51	5.04						
Weſt	6.00										
☉ ſet	6.00	6.00	5.59	5.58	5.57	5.57	5.56	5.55	5.54	5.54	5.53

A Sun-Dial for the Latitude of 5 Degrees.

NORTH DECLINATION.

Deg. Min.	2 d 30m	Deg, Min.	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	Point	h m	h m	h m	12	h m	h m	h m	h m	h m
South	12	North	12	12	12	h m	12	12	12	12	12
s by w	0.02	n by w	Zen. Weſt.	0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.16
s s w	0.04	n n w		0.04	0.08	0.13	0.18	0.22	0.26	0.30	0.33
w bys	0.07	nwby n		0.07	0.14	0.21	0.28	0.35	0.43	0.49	0.54
s w	0.10	n w		0.10	0.20	0.31	0.42	0.53	1.05	1.15	1.22
w byw	0.16	nw bw		0.15	0.31	0.47	1.04	1.21	1.40	1.57	2.10
w s w	0.24	w n w		0.25	0.51	1.18	1.49	2.24	3.08	4.00	
w by s	0.48	w by n		0.54	2.01						
Weſt	4.00	Weſt									
⊙ ſet	6.01	⊙ ſet	6.02	6.03	6.04	6.04	6.05	6.06	6.07	6.08	6.09
Sun's Ampl.	d m 2.30	Sun's Ampl.	d m 5.01	d m 7.31	d m 10.2	d m 12.32	d m 15.3	d m 17.34	d m 20.5	d m 22.5	d m 23.35

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.04	0.06	0.08	0.10	0.12	0.14	0.16	0.18	0.20	0.22	0.24
s s w	0.08	0.12	0.17	0.21	0.25	0.29	0.34	0.38	0.43	0.47	0.50
sw by s	0.13	0.20	0.27	0.33	0.40	0.47	0.54	1.02	1.09	1.16	1.21
s w	0.20	0.30	0.40	0.50	1.00	1.11	1.22	1.33	1.45	1.55	2.02
sw by w	0.30	0.45	1.00	1.15	1.31	1.46	2.03	2.21	2.40	2.56	3.11
w s w	0.48	1.11	1.35	2.00	2.26	2.53	3.24	3.59	4.43	5.35	
w by s	1.35	2.21	3.09	4.03	5.11						
Weſt	6.00										
⊙ ſets	6.00	5.59	5.58	5.57	5.56	5.56	5.55	5.54	5.53	5.52	5.51

A Sun-Dial for the Latitude of 6 Degrees.

NORTH DECLINATION.

Deg. Min.	2 d 30m	5 d	Deg. Min.	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 29
Point	h m	h m	Point	h m	h m	h m	h m	h m	h m	h m	h
South	12	12	North	12	12	12	12	12	12	12	1
s by w	0.03	0.01	n by w	0.01	0.03	0.05	0.07	0.09	0.12	0.13	0.
s s w	0.06	0.02	n n w	0.03	0.07	0.11	0.15	0.20	0.25	0.28	0.
sw by s	0.09	0.03	nw byn	0.04	0.11	0.18	0.25	0.32	0.40	0.46	0.
s w	0.14	0.04	n w	0.06	0.16	0.27	0:38	0.49	1.01	1.10	1.
sw by w	0.21	0.06	nw b w	0.09	0.25	0.41	0.57	1.15	1.34	1.50	2.
w s w	0.33	0.09	w n w	0.15	0.40	1.08	1.38	2.12	2.55	3.44	
w by s	1.06	0.20	w b n	0.32	1.34	3.24					
West	4.22	2.15	West								
⊙ ſet	6.01	6.02	⊙ ſet	6.03	6.04	6.05	6.06	6.07	6.09	6.10	6.
Sun's	d m	d m	Sun's	d m	d m	d m	d m	d m	d m	d m	d
Ampl.	2.30	5.01	Ampl.	7.32	10.3	12.34	15.5	17.36	20.6	22.7	23.

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.05	0.07	0.09	0.11	0.13	0.25	0.17	0.19	0.21	0.23	0.24
s s w	0.10	0.14	0.18	0.22	0.27	0.31	0.35	0.40	0.44	0.48	0.51
sw by s	0.16	0.23	0.29	0.36	0.43	0.50	0.57	1.04	1.12	1.18	1.23
s w	0.24	0.34	0.44	0.54	1.04	1.15	1.25	1.37	1.48	1.58	2.06
sw by w	0.36	0.50	1.05	1.20	1.36	1.52	2.08	2.26	2.45	3.01	3.15
w s w	0.57	1.20	1.44	2.08	2.34	3.01	3.31	4.06	4.48	5.37	
w by s	1.51	2.35	3.22	4.13	5.16						
West	6.00										
⊙ ſet	6.00	5.59	5.58	5.57	5.56	5.55	5.54	5.53	5.51	5.50	5.49

A Sun-Dial for the Latitude of 7 Degrees.

NORTH DECLINATION.

Deg. Min.	2 d 30m	5 d	Deg, Min.	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	Point	h m	h m	12	h m	h m	h m	h m	h m
South	12	12	North	12	12	h m	12	12	12	12	12
s by w	0.04	0.02	n by w	0.00	0.02	0.04	0.07	0.09	0.11	0.13	0.14
s s w	0.07	0.03	n n w	0.01	0.05	0.09	0.14	0.18	0.23	0.27	0.30
s w by s	0.12	0.05	nwby n	0.01	0.08	0.15	0.22	0.29	0.37	0.44	0.48
s w	0.18	0.08	n w	0.02	0.12	0.23	0.33	0.45	0.56	1.00	1.14
sw byw	0.27	0.12	nw bw	0.03	0.18	0.34	0.51	1.08	1.27	1.43	1.57
w s w	0.43	0.19	w n w	0.05	0.30	0.57	1.27	2.00	2.42	3.28	
w by s	1.23	0.39	w by n	0.10	1.08	2.36					
Weſt	4.37	2.58									
⊙ ſet	6.01	6.02	⊙ ſet	6.03	6.05	6.06	6.08	6.09	6.10	6.11	6.12
Sun's	d m	d m	Sun's	d m	d m	d m	d m	d m	d m	d m	d m
Ampl.	2.31	5.02	Ampl.	7.33	10.2	12.35	15.7	17.38	20.9	22.10	23.40

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.06	0.07	0.09	0.11	0.13	0.16	0.18	0.20	0.22	0.24	0.25
s s w	0.12	0.16	0.20	0.24	0.28	0.33	0.37	0.41	0.46	0.50	0.53
sw by s	0.19	0.25	0.32	0.39	0.45	0.52	0.59	1.07	1.15	1.21	1.25
s w	0.28	0.38	0.48	0.58	1.08	1.18	1.29	1.40	1.52	2.02	2.09
sw by w	0.41	0.56	1.11	1.26	1.41	1.57	2.14	2.31	2.50	3.07	3.19
w s w	1.06	1.29	1.52	2.16	2.41	3.08	3.38	4.12	4.52	5.39	
w by s	2.06	2.49	3.33	4.22	5.20						
Weſt	6.00										
⊙ ſets	6.00	5.59	5.58	5.57	5.55	5.54	5.52	5.51	5.50	5.49	5.48

A Sun-Dial for the Latitude of 8 Degrees.

NORTH DECLINATION.

Deg. Min.	2 d 30m	5 d	7 d 30m	Deg. Min.	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23m 29m
Point	h m	h m	h m	Point	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	North	12	12	12	12	12	12	12
s by w	0.04	0.02	0.00	n by w	0.02	0.04	0.06	0.08	0.10	0.12	0.13
s s w	0.09	0.05	0.01	n n w	0.03	0.08	0.12	0.16	0.21	0.25	0.28
sw by s	0.15	0.08	0.01	nw byn	0.05	0.12	0.20	0.27	0.34	0.41	0.45
s w	0.22	0.12	0.02	n w	0.08	0.18	0.29	0.40	0.52	1.02	1.09
sw by w	0.33	0.18	0.03	nw b w	0.12	0.28	0.45	1.02	1.20	1.35	1.49
w s w	0.52	0.29	0.05	w n w	0.20	0.46	1.16	1.48	2.28	3.11	4.06
w by s	1.39	0.56	0.10	w b n	0.44	1.59					
Weſt	4.48	3.26	1.22	Weſt							
⊙ ſet	6.01	6.03	6.04	⊙ ſet	6.06	6.07	6.09	6.10	6.12	6.13	6.14
Sun's	d m	d m	d m	Sun's	d m	d m	d m	d m	d m	d m	d m
Ampl.	2.31	5.02	7.34	Ampl.	10.6	12.38	15.9	17.40	20.12	22.13	23.45

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.06	0.08	0.10	0.12	0.14	0.16	0.18	0.21	0.23	0.25	0.26
s s w	0.13	0.17	0.21	0.26	0.30	0.34	0.38	0.43	0.47	0.51	0.54
sw by s	0.21	0.28	0.34	0.41	0.48	0.55	1.02	1.09	1.17	1.23	1.28
s w	0.32	0.41	0.51	1.01	1.11	1.22	1.33	1.44	1.55	2.05	2.13
sw by w	0.47	1.02	1.16	1.31	1.46	2.02	2.19	2.36	2.55	3.09	3.22
w s w	1.14	1.37	2.00	2.24	2.48	3.15	3.44	4.17	4.56	5.39	
w by s	2.20	3.01	3.44	4.30	5.24						
Weſt	6.00										
⊙ ſet	6.00	5.59	5.57	5.56	5.54	5.53	5.51	5.50	5.48	5.47	5.46

A Sun-Dial for the Latitude of 9 Degrees.

NORTH DECLINATION.

Deg. Min.	2 d 30m	5 d	7 d 30m	Deg. Min.	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	Point	h m	12	h m	h m	h m	h m	h m
South	12	12	12	North	12	h m	12	12	12	12	12
s by w	0.05	0.03	0.01	n by w	0.01	0.03	0.05	0.07	0.09	0.11	0.12
s s w	0.11	0.07	0.03	n n w	0.02	0.06	0.10	0.14	0.19	0.23	0.26
sw bys	0.17	0.11	0.04	nw byw	0.03	0.10	0.17	0.24	0.31	0.38	0.43
s w	0.26	0.16	0.06	n w	0.04	0.14	0.25	0.36	0.47	0.57	1.05
sw byw	0.38	0.24	0.09	nw byw	0.06	0.22	0.38	0.55	1.13	1.30	1.42
w s w	1.00	0.38	0.14	w n w	0.10	0.36	1.04	1.36	2.15	2.55	3.42
w by s	1.53	1.13	0.29	w by n	0.21	1.27					
West	4.56	3.46	2.15								
☉ ſet	6.01	6.03	6.04	☉ ſet	6.06	6.08	6.10	6.12	6.14	6.15	6.16
Sun's	d m	d m	d m	Sun's	d m	d m	d m	d m	d m	d m	d m
Ampl.	2.31	5.03	7.35	Ampl.	10.7	12.39	15.11	17.43	20.16	22.18	23.59

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.07	0.09	0.11	0.13	0.15	0.17	0.19	0.21	0.23	0.25	0.26
s s w	0.15	0.19	0.23	0.27	0.31	0.36	0.40	0.44	0.49	0.52	0.56
sw by s	0.24	0.30	0.37	0.44	0.50	0.57	1.04	1.12	1.19	1.25	1.31
s w	0.36	0.45	0.55	1.05	1.15	1.26	1.36	1.47	1.59	2.09	2.16
sw by w	0.53	1.07	1.22	1.36	1.52	2.07	2.24	2.41	2.59	3.14	3.28
w s w	1.23	1.45	2.08	2.31	2.55	3.21	3.50	4.22	5.00	5.40	
w by s	2.33	3.12	3.53	4.35	5.27						
West	6.00										
☉ ſets	6.00	5.59	5.57	5.56	5.54	5.52	5.50	5.48	5.46	5.45	5.44

A Sun-Dial for the Latitude of 10 Degrees.

NORTH DECLINATION.

Deg. Min.	2 d 30m	5 d	7 d 30m	10 d
Point	h m	h m	h m	h m
South	12	12	12	12
s by w	0.06	0.04	0.02	Zen. Weſt
s s w	0.12	0.08	0.04	
sw by s	0.20	0.13	0.07	
s w	0.30	0.20	0.10	
sw by w	0.44	0.30	0.15	
w [illegible] w	1.09	0.47	0.24	
w by s	2.07	1.28	0.47	
Weſt	5.03	4.01	2.47	
⊙ ſet	6.02	6.04	6.05	6.07
Sun's Ampl.	d m 2.32	d m 5.05	d m 7.37	d m 10.10

Deg. Min.	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m
North	12	12	12	12	12	12
n by w	0.02	0.04	0.06	0.08	0.10	0.12
n n w	0.04	0.09	0.13	0.18	0.21	0.24
nw byn	0.07	0.14	0.21	0.29	0.35	0.40
n w	0.10	0.21	0.32	0.43	0.53	1.00
nw b w	0.15	0.32	0.49	1.06	1.23	1.35
w n w	0.25	0.53	1.24	2.01	2.39	3.19
w b n	0.59	1.07				
Weſt						
⊙ ſet	6.09	6.11	6.13	6.15	6.16	6.17
Sun's Ampl.	d m 12.42	d m 15.15	d m 17.47	d m 20.20	d m 22.[illegible]	d m 23.54

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.08	0.10	0.12	0.14	0.16	0.18	0.20	0.22	0.24	0.26	0.27
s s w	0.16	0.21	0.25	0.29	0.33	0.37	0.42	0.46	0.51	0.54	0.57
sw by s	0.26	0.33	0.40	0.46	0.53	1.00	1.07	1.14	1.22	1.28	1.33
s w	0.39	0.49	0.59	1.09	0.19	1.29	1.40	1.51	2.02	2.12	2.19
sw by w	0.58	1.13	1.27	1.42	1.57	2.12	2.28	2.45	3.03	3.19	3.32
w s w	1.31	1.53	2.15	2.38	3.02	3.27	3.55	4.26	5.03	5.41	
w by s	2.44	3.22	4.01	4.42	5.29						
Weſt	6.00										
⊙ ſet	6.00	5.58	5.56	5.55	5.53	5.51	5.49	5.47	5.45	5.44	5.43

A Sun-Dial for the Latitude of 11 Degrees.

NORTH DECLINATION.

Deg. Min.	2 d 30m	5 d	7 d 30m	10 d	Deg. Min.	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	Point	h m	h m	h m	h m	h m	h m
South	12	12	12	12	North	12	12	12	12	12	12
by w	0.07	0.05	0.03	0.01	n by w	0.01	0.03	0.05	0.07	0.09	0.11
s s w	0.14	0.10	0.06	0.02	n n w	0.02	0.07	0.11	0.16	0.20	0.22
w bys	0.22	0.16	0.09	0.03	nw by n	0.04	0.11	0.18	0.26	0.32	0.37
s w	0.34	0.24	0.14	0.04	n w	0.06	0.17	0.28	0.39	0.49	0.56
w byw	0.50	0.35	0.21	0.06	nw byw	0.09	0.25	0.42	1.00	1.15	1.28
w s w	1.17	0.56	0.33	0.08	w n w	0.15	0.41	1.12	1.47	2.23	2.59
w by s	2.19	1.43	1.03	0.20	w by n	0.33	1.55	1.			
Weſt	5.08	4.13	3.09	1.40							
⊙ ſet	6.02	6.04	6.06	6.08	⊙ ſet	6.10	6.12	6.14	6.16	6.18	6.19
Sun's	d m	d m	d m	d m	Sun's	d m	d m	d m	d m	d m	d m
Ampl.	2.32	5.05	7.38	10.11	Ampl.	12.44	15.17	17.50	20.24	22.27	23.59

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	29 d 23m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.09	0.11	0.13	0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.28
s s w	0.18	0.22	0.26	0.30	0.34	0.39	0.43	0.47	0.52	0.56	0.59
sw by s	0.29	0.36	0.42	0.49	0.55	1.02	1.09	1.16	1.24	1.30	1.35
s w	0.43	0.53	1.03	1.12	1.22	1.33	1.43	1.54	2.05	2.15	2.22
sw by w	1.04	1.18	1.32	1.47	2.01	2.17	2.33	2.49	3.07	3.23	3.35
w s w	1.39	2.01	2.22	2.45	3.08	3.33	4.00	4.30	5.05	5.41	
w by s	2.55	3.31	4.08	4.47	5.31						
Weſt	6.00										
⊙ ſet	6.00	5.58	5.56	5.54	5.52	5.50	5.48	5.46	5.44	5.42	5.41

A Sun-Dial for the Latitude of 12 Degrees.

NORTH DECLINATION.

Deg. Min.	2 d 30m	5 d	7 d 30m	10 d	Deg. Min.	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	Point	h m	h m	h m	h m	h m	h m
South	12	12	12	12	North	12	12	12	12	12	12
s by w	0.07	0.06	0.04	0.02	n by w	0.00	0.02	0.04	0.07	0.09	0.10
s s w	0.16	0.12	0.08	0.04	n n w	0.01	0.05	0.10	0.14	0.18	0.21
sw by s	0.25	0.19	0.12	0.05	nw by n	0.01	0.08	0.15	0.23	0.29	0.34
s w	0.37	0.28	0.18	0.08	n w	0.02	0.12	0.23	0.35	0.44	0.51
sw by w	0.55	0.41	0.27	0.12	nw b w	0.03	0.19	0.35	0.53	1.09	1.21
w s w	1.25	1.04	0.42	0.19	w n w	0.05	0.31	1.00	1.34	2.07	2.40
w by s	2.31	1.56	1.19	0.38	w b n	0.11	1.17				
West	5.12	4.23	3.27	2.16							
☉ ſet	6.02	6.04	6.06	6.09	☉ ſet	6.11	6.13	6.15	6.18	6.20	6.21
Sun's	d m	d m	d m	d m	Sun's	d m	d m	d m	d m	d m	d m
Ampl.	2.33	5.07	7.40	10,13	Ampl.	12.48	15.20	17.54	20,28	22.31	24.5

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.09	0.11	0.13	0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.29
s s w	0.20	0.24	0.28	0.32	0.36	0.40	0.44	0.49	0.53	0.57	1.00
sw by s	0.32	0.38	0.45	0.51	0.58	1.05	1.12	1.19	1.26	1.32	1.37
s w	0.47	0.56	1.06	1.16	1.26	1.36	1.46	1.57	2.18	2.18	2.25
sw by w	1.09	1.23	1.37	1.52	2.06	2.21	2.37	2.53	3.11	3.27	3.39
w s w	1.47	2.07	2.29	2.51	3.14	3.38	4.04	4.33	5.07	5.41	
w by s	3.05	3.39	4.14	4.51	5.32						
West	6.00										
☉ ſet	6.00	5.58	5.56	5.54	5.51	5.49	5.47	5.45	5.42	5.40	5.39

A Sun-Dial for the Latitude of 13 Degrees.

NORTH DECLINATION.

Deg. Min.	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	Deg. Min.	15 d	17 d 30m	20 d	22 d	23m 29m
Point	h m	h m	h m	h m	h m	Point	h m	h m	h m	h m	h m
South	12	12	12	12	12	North	12	12	12	12	12
s by w	0.08	0.06	0.04	0.02	0.00	n by w	0.02	0.04	0.06	0.08	0.09
s s w	0.17	0.13	0.09	0.05	0.01	n n w	0.03	0.08	0.12	0.16	0.19
sw by s	0.28	0.21	0.15	0.08	0.01	nw by n	0.06	0.13	0.20	0.26	0.31
s w	0.41	0.31	0.22	0.12	0.02	n w	0.08	0.19	0.30	0.40	0.47
sw by w	1.01	0.47	0.32	0.18	0.03	nw by w	0.13	0.29	0.46	1.01	1.13
w s w	2.33	1.12	0.51	0.28	0.05	w n w	0.21	0.49	1.21	1.52	2.22
w by s	2.41	2.08	1.33	0.54	0.10	w by n	0.48				
Weſt	5.16	4.31	3.41	2.41	1.05						
⊙ ſet	6.02	6.05	6.07	6.09	6.11	⊙ ſet	6.14	6.16	6.19	6.21	6.23
Sun's	d m	d m	d m	d m	d m	Sun's	d m	d m	d m	d m	d m
Ampl.	2.34	5.08	7.42	10.16	12.49	Ampl.	15.24	17.59	20.33	22 37	24.11

SOUTH DECLINATION

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.10	0.12	0.14	0.16	0.18	0.20	0.22	0.24	0.26	0.28	0.29
s s w	0.21	0.25	0.29	0.33	0.38	0.42	0.46	0.50	0.55	0.59	1.02
sw by s	0.34	0.41	0.47	0.54	1.00	1.07	1.14	1.21	1.28	1.34	1.39
s w	0.51	1.00	1.10	1.19	1.29	1.39	1.50	2.01	2.12	2.21	2.29
sw by w	1.14	1.28	1.42	1.56	2.11	2.26	2.41	2.58	3.15	3.30	3.42
w s w	1.54	2.15	2.36	2.57	3.20	3.43	4.08	4.37	5.09	5.40	
w by s	3.14	3.47	4.20	4.55	5 34						
Weſt	6.00										
⊙ ſet	6.00	5.58	5.55	5.53	5.51	5.49	5.46	5.44	5.41	5.39	5.37

A Sun-Dial for the Latitude of 14 Degrees.

NORTH DECLINATION.

Deg. Min.	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	Deg, Min.	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	Point	h m	h m	h m	h m	h m
South	12	12	12	12	12	North	12	12	12	12	12
s by w	0.09	0.07	0.05	0.03	0.01	n by w	0.01	0.03	0.05	0.07	0.08
s s w	0.19	0.15	0.11	0.07	0.03	n n w	0.02	0.06	0.10	0.14	0.17
sw by s	0.30	0.24	0.17	0.11	0.04	nwbyn	0.03	0.10	0.17	0.23	0.28
s w	0.45	0.35	0.26	0.16	0.06	n w	0.04	0.15	0.26	0.35	0.43
sw byw	1.06	0.52	0.38	0.24	0.09	nw bw	0.06	0.22	0.40	0.54	1.06
w s w	1.41	1.20	0.59	0.38	0.15	w n w	0.10	0.37	1.08	1.38	2.05
w by s	2.52	2.19	1.46	1.10	0.29	w by n	0.22	1.48			
Weſt	3.19	4.38	3.53	3.00	1.49	Weſt					
⊙ ſet	6.02	6.05	6.07	6.10	6.12	⊙ ſet	6.15	6.18	6.21	6.23	6.25
Sun's	d m	d m	d m	d m	d m	Sun's	d m	d m	d m	d m	d m
Ampl.	2.34	5.09	7.44	10.19	12.53	Ampl.	15.28	18.3	20.38	22.43	24.16

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	d om	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.11	0.13	0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.29	0.30
s s w	0.23	0.27	0.31	0.35	0.39	0.44	0.48	0.52	0.57	1.01	1.03
sw by s	0.37	0.43	0.50	0.56	1.03	1.10	1.16	1.23	1.31	1.36	1.41
s w	0.54	1.04	1.13	1.23	1.33	1.43	1.53	2.04	2.15	2.24	2.31
sw by w	1.20	1.33	1.47	2.01	2.15	2.30	2.45	3.02	3.19	3.33	3.45
w s w	2.01	2.21	2.42	3.03	3.25	3.48	4.12	4.40	5.11		
w by s	3.22	3.53	4.25	4.59	5.35						
Weſt	6.00										
⊙ ſet	6.00	5.58	5.55	5.53	5.50	5.48	5.45	5.42	5.39	5.37	5.35

A Sun-Dial for the Latitude of 15 Degrees.

NORTH DECLINATION.

Deg. Min.	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	Deg. Min.	15 d	17 d 30m	20 d	22 d	23m 29m
Point	h m	h m	h m	h m	h m	Point	h m	h m	h m	h m	h m
South	12	12	12	12	12	North	12	12	12	12	12
s by w	0.10	0.08	0.06	0.04	0.02	n by w	Zen. West	0.02	0.04	0.06	0.07
s s w	0.21	0.16	0.12	0.08	0.04	n n w		0.04	0.09	0.12	0.15
sw by s	0.33	0.26	0.20	0.13	0.07	nw by n		0.07	0.14	0.20	0.25
s w	0.49	0.39	0.30	0.20	0.10	n w		0.11	0.22	0.31	0.38
sw by w	1.11	0.58	0.44	0.30	0.15	nw by w		0.16	0.33	0.47	0.59
w s w	1.48	1.28	1.08	0.47	0.24	w n w		0.26	0.56	1.24	1.50
w by s	3.00	2.30	1.58	1.24	0.46	w by n		1.06			
Weſt	5.22	4.44	4.02	3.15	2.17	Weſt					
⊙ ſet	6.02	6.05	6.08	6.11	6.13	⊙ ſet	6.16	6.19	6.22	6.25	6.27
Sun's Ampl.	d m 2.35	d m 5.10	d m 7.46	d m 10.21	d m 12.56	Sun's Ampl.	d m 15.32	d m 18.8	d m 20.44	d m 22.49	d m 24.24

SOUTH DECLINATION

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.12	0.14	0.16	0.18	0.20	0.22	0.24	0.26	0.28	0.30	0.31
s s w	0.24	0.28	0.32	0.36	0.40	0.45	0.49	0.53	0.53	1.02	1.04
sw by s	0.39	0.46	0.52	0.59	1.05	1.12	1.18	1.25	1.33	1.39	1.43
s w	0.58	1.07	1.17	1.26	1.36	1.46	1.56	2.07	2.18	2.27	2.34
sw by w	1.25	1.38	1.52	2.06	2.20	2.34	2.49	3.05	3.22	3.37	3.48
w s w	2.08	2.28	2.48	3.08	3.29	3.52	4.16	4.42	5.12		
w by s	3.30	4.00	4.30	5.02	5.36						
Weſt	6.00										
⊙ ſet	6.00	5.58	5.55	5.52	5.49	5.47	5.44	5.41	5.38	5.35	5.33

A Sun-Dial for the Latitude of 16 Degrees.

NORTH DECLINATION.

Deg. Min.	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	Deg. Min.	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	Point	h m	h m	h m	h m
South	12	12	12	12	12	12	North	12	12	12	12
s by w	0.11	0.09	0.07	0.05	0.03	0.01	n by w	0.01	0.03	0.05	0.07
s s w	0.22	0.18	0.14	0.10	0.06	0.02	n n w	0.03	0.07	0.11	0.14
sw by s	0.35	0.29	0.23	0.16	0.10	0.03	nw by n	0.04	0.11	0.17	0.22
s w	0.52	0.43	0.34	0.24	0.14	0.04	n w	0.06	0.17	0.26	0.33
sw by w	1.16	1.03	0.49	0.35	0.21	0.06	nw by w	0.10	0.26	0.40	0.52
w s w	1.55	1.36	1.16	0.55	0.33	0.10	w n w	0.16	0.44	1.11	1.34
w by s	3.08	2.39	2.09	1.37	1.02	0.20	w by n	0.36			
Weſt	5.25	4.49	4.11	3.28	2.37	1.23					
⊙ ſet	6.03	6.06	6.09	6.12	6.15	6.18	⊙ ſet	6.21	6.24	6.27	6.29
Sun's Ampl.	d m 2.36	d m 5.12	d m 7.48	d m 10.24	d m 13.0	d m 15.37	Sun's Ampl.	m 18.13	d m 20.51	d m 22.56	d m 24.32

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.13	0.14	0.16	0.18	0.20	0.22	0.24	0.26	0.28	0.30	0.32
s s w	0.26	0.30	0.34	0.38	0.42	0.46	0.50	0.55	0.59	1.03	1.06
sw by s	0.42	0.48	0.54	1.01	1.07	1.14	1.21	1.28	1.35	1.41	1.45
s w	1.02	1.11	1.20	1.29	1.39	1.49	1.59	2.10	2.21	2.30	2.37
sw by w	1.30	1.43	1.56	2.10	2.24	2.38	2.53	3.09	3.25	3.40	3.51
w s w	2.15	2.34	2.54	3.14	3.34	3.56	4.19	4.45	5.13		
w by s	3.37	4.05	4.34	5.04	5.36						
Weſt	6.00										
⊙ ſet	6.00	5.57	5.54	5.51	5.48	5.45	5.42	5.39	5.36	5.33	5.31

A Sun-Dial for the Latitude of 17 Degrees.

NORTH DECLINATION.

Deg. Min.	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	Deg. Min.	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	Point	h m	h m	h m	h m
South	12	12	12	12	12	12	North	12	12	12	12
s by w	0.11	0.09	0.07	0.06	0.04	0.02	n by w	0.00	0.02	0.04	0.06
s s w	0.24	0.20	0.16	0.12	0.08	0.03	n n w	0.01	0.05	0.09	0.12
sw by s	0.38	0.32	0.25	0.19	0.13	0.06	nwbyn	0.01	0.08	0.15	0.19
s w	0.56	0.47	0.38	0.28	0.18	0.08	n w	0.02	0.13	0.22	0.29
sw by w	1.21	1.08	0.55	0.41	0.27	0.12	nw bw	0.03	0.19	0.33	0.45
w s w	2.02	1.43	1.23	1.03	0.42	0.19	w n w	0.05	0.33	0.58	1.20
w by s	3.16	2.48	2.20	1.49	1.16	0.37	w byn	0.11	1.36		
Weſt	5.27	4.53	4.18	3 39	2.54	1.55					
w by n					5.50	5.11					
⊙ ſet	6.03	6.06	6.09	6.12	6.15	6.19	⊙ ſet	6.22	6.25	6.28	6.31
Sun's Ampl.	d m 2.36	d m 5.13	d m 7.50	d m 10.28	d m 13.04	d m 15.42	Sun's Ampl.	d m 18.19	d m 20.57	d m 23.4	d m 24.40

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.13	0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.29	0.31	0.33
s s w	0.28	0.32	0.36	0.39	0.43	0.47	0.52	0.56	1.01	1.04	1.07
sw by s	0.44	0.50	0.57	1.03	1.09	1.16	1.23	1.30	1.37	1.43	1.47
s w	1.05	1.14	1.24	1.33	1.42	1.51	2.02	2.13	2.23	2.32	2.39
sw by w	1.35	1.48	2.01	2.14	2.28	2.42	2.57	3.12	3.29	3.42	3.54
w s w	2.21	2.40	2.59	3.18	3.39	4.00	4.22	4.47	5.14		
w by s	3.43	4.10	4.38	5.07	5.37						
Weſt	6.00										
⊙ ſet	6.00	5.57	5.54	5.51	5.48	5.45	5.41	5.38	5.35	5.32	5.29

A Sun-Dial for the Latitude of 18 Degrees.

NORTH DECLINATION.

Deg. Min.	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	Deg. Min.	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	Point	h m	h m	h m
South	12	12	12	12	12	12	12	North	12	12	12
s by w	0.12	0.10	0.08	0.06	0.04	0.02	0.00	n by w	0.02	0.03	0.05
s s w	0.25	0.21	0.17	0.13	0.09	0.05	0.01	n n w	0.04	0.07	0.10
s w by s	0.40	0.34	0.28	0.21	0.15	0.09	0.01	nw byn	0.06	0.12	0.16
s w	1.00	0.50	0.41	0.32	0.22	0.12	0.02	n w	0.09	0.17	0.24
sw byw	1.26	1.13	1.00	0.47	0.32	0.18	0.03	nw bw	0.13	0.27	0.38
w s w	2.08	1.50	1.31	1.11	0.51	0.29	0.05	w n w	0.21	0.45	1.06
w by s	3.23	2.57	2.29	2.00	1.29	0.53	0.10	w by n	0.53		
West	5.29	4.57	4.24	3.49	3.08	2.18	0.56	West			
w by n					5.51	5.15	4.32				
⊙ ſet	6.03	6.06	6.09	6.13	6.16	6.20	6.23	⊙ ſet	6.27	6.30	6.33
Sun's Ampl.	d m 2.37	d m 5.15	d m 7.53	d m 10.31	d m 13.9	d m 15.47	d m 18.26	Sun's Ampl.	d m 21.4	d m 23.12	d m 24.49

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.14	0.16	0.18	0.20	0.22	0.24	0.26	0.28	0.30	0.32	0.33
s s w	0.29	0.33	0.37	0.41	0.45	0.49	0.53	0.58	1.02	1.06	1.08
sw by s	0.47	0.53	0.59	1.05	1.12	1.18	1.25	1.32	1.39	1.45	1.49
s w	1.09	1.18	1.27	1.36	1.46	1.55	2.05	2.15	2.26	2.35	2.42
sw byw	1.39	1.52	2.05	2.18	2.32	2.45	3.00	3.15	3.31	3.45	3.56
w s w	2.27	2.45	3.04	3.23	3.43	4.03	4.25	4.49	5.15		
w by s	3.49	4.15	4.41	5.09	5.38						
West	6.00										
⊙ ſet	6.00	5.57	5.54	5.51	5.47	5.44	5.40	5.37	5.33	5.30	5.27

A Sun-Dial for the Latitude of 19 Degrees.

NORTH DECLINATION.

Deg. Min.	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	Deg. Min.	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	Point	h m	h m	h m
South	12	12	12	12	12	12	12	North	12	12	12
s by w	0.13	0.11	0.09	0.07	0.05	0.03	0.01	n by w	0.01	0.03	0.04
s s w	0.27	0.23	0.19	0.15	0.11	0.07	0.03	n n w	0.02	0.05	0.08
sw by s	0.43	0.37	0.30	0.24	0.18	0.11	0.05	nwbyn	0.03	0.09	0.13
s w	1.03	0.54	0.45	0.36	0.26	0.17	0.07	n w	0.04	0.13	0.20
sw by w	1.31	1.18	1.05	0.52	0.38	0.24	0.09	nw bw	0.06	0.20	0.31
w s w	2.15	1.57	1.38	1.19	0.59	0.37	0.15	w n w	0.10	0.33	0.52
w by s	3.30	3.04	2.38	2.11	1.41	1.08	0.29	w byn	0.23		
Weſt	5.31	5.01	4.30	3 57	3.20	2.36	1.35				
w by n					5.52	5.19	4.40				
⊙ ſet	6.03	6.07	6.10	6.14	6.17	6.21	0.25	⊙ ſet	6.28	6.31	6.34
Sun's	d m	d m	d m	d m	d m	d m	d m	Sun's	d m	d m	d m
Ampl.	2.38	5.17	7.56	10.35	13.14	15.53	18.33	Ampl.	21.12	23.58	24.58

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.29	0.30	0.32	0.34
s s w	0.31	0.35	0.38	0.42	0.46	0.50	0.54	0.59	1.03	1.07	1.09
sw by s	0.49	0.55	1.01	1.08	1.14	1.21	1.27	1.34	1.41	1.47	1.51
s w	1.12	1.21	1.30	1.39	1.48	1.58	2.07	2.18	2.29	2.37	2.44
sw by w	1.44	1.57	2.09	2.23	2.36	2.49	3.04	3.19	3.34	3.48	3.58
w s w	2.33	2.51	3.09	3.27	3.46	4.06	4.28	4.51	5.16		
w by s	3.54	4.19	4.44	5.10	5.39						
Weſt	6.00										
⊙ ſet	6.00	5.57	5.53	5.50	5.46	5.43	5.39	5.35	5.32	5.29	5.26

A Sun-Dial for the Latitude of 20 Degrees.

NORTH DECLINATION.

Deg. Min.	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	Deg. Min.	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	Point	h m	h m	h m
South	12	12	12	12	12	12	12	North	12	12	12
s by w	0.14	0.12	0.10	0.08	0.06	0.04	0.02	n by w	Zen. Weſt	0.02	0.03
s s w	0.28	0.25	0.21	0.17	0.13	0.09	0.05	n n w		0.04	0.06
s w by s	0.45	0.39	0.32	0.26	0.20	0.14	0.07	nw byn		0.06	0.10
s w	1.07	0.58	0.49	0.40	0.30	0.21	0.11	n w		0.09	0.16
sw byw	1.36	1.23	1.10	0.58	0.44	0.30	0.15	nw bw		0.13	0.24
w s w	2.21	2.03	1.45	1.26	1.07	0.46	0.24	w n w		0.22	0.40
w by s	3.36	3.11	2.45	2.20	1.52	1.21	0.45	w by n			
Weſt	5.32	5.04	4.35	4.04	3.30	2.50	2.00	Weſt			
w by n					5.54	5.23	4.47				
⊙ ſet	6.03	6.07	6.11	6.15	6.18	6.22	6.26	⊙ ſet	6.30	6.33	6.36
Sun's Ampl.	d m 2.40	d m 5.19	d m 7.59	d m 10.39	d m 13.19	d m 16.0	d m 18.40	Sun's Ampl.	d m 21.20	d m 23.29	d m 25.8

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.16	0.17	0.19	0.21	0.23	0.25	0.27	0.29	0.31	0.33	0.34
s s w	0.32	0.36	0.40	0.44	0.48	0.52	0.56	1.00	1.05	1.08	1.11
sw by s	0.51	0.58	1.04	1.10	1.16	1.23	1.29	1.36	1.43	1.49	1.53
s w	1.16	1.24	1.33	1.42	1.51	2.01	2.10	2.20	2.31	2.40	2.47
sw byw	1.48	2.01	2.14	2.26	2.39	2.53	3.07	3.22	3.37	3.50	4.00
w s w	2.38	2.56	3.13	3.31	3.50	4.09	4.30	4.52	5.16		
w by s	3.59	4.23	4.47	5.12	5.39						
Weſt	6.00										
⊙ ſet	6.00	5.57	5.53	5.49	5.45	5.42	5.38	5.34	5.30	5.27	5.24

A Sun-Dial for the Latitude of 21 Degrees.

NORTH DECLINATION.

Deg. Min.	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	Deg. Min.	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	Point	h m	h m
South	12	12	12	12	12	12	12	12	North	12	12
s by w	0.14	0.13	0.11	0.09	0.07	0.05	0.03	0.01	n by w	0.01	0.02
s s w	0.30	0.26	0.22	0.18	0.14	0.10	0.06	0.02	n n w	0.02	0.04
sw by s	0.48	0.42	0.35	0.29	0.23	0.16	0.10	0.03	nw by n	0.03	0.07
s w	1.10	1.01	0.52	0.43	0.34	0.24	0.15	0.04	n w	0.04	0.11
sw by w	1.40	1.28	1.15	1.03	0.49	0.36	0.21	0.06	nw by w	0.06	0.17
w s w	2.26	2.09	1.52	1.34	1.15	0.55	0.33	0.10	w n w	0.11	0.28
w by s	3.41	3.18	2.54	2.29	2.03	1.33	1.00	0.20	w by n	0.24	
Weſt	5.34	5.07	4.40	4.11	3.39	3.03	2.19	1.14			
w by n					5.55	5.26	4.53	4.12			
⊙ ſet	6.04	6.08	6.12	6.16	6.20	6.24	6.28	6.32	⊙ ſet	6.35	6.38
Sun's Ampl.	d m 2.41	d m 5.21	d m 8.02	d m 10.43	d m 13.24	d m 16.6	d m 18.47	d m 21.29	Sun's Ampl.	d m 23.39	d m 25.18

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.16	0.18	0.20	0.22	0.24	0.26	0.28	0.30	0.32	0.34	0.35
s s w	0.34	0.38	0.42	0.45	0.49	0.54	0.58	1.02	1.06	1.10	1.12
sw by s	0.54	1.00	1.06	1.12	1.19	1.25	1.32	1.38	1.45	1.51	1.55
s w	1.19	1.28	1.37	1.46	1.54	2.04	2.13	2.23	2.33	2.42	2.49
sw by w	1.53	2.05	2.18	2.30	2.43	2.56	3.10	3.24	3.39	3.52	4.02
w s w	2.43	3.01	3.18	3.35	3.54	4.12	4.32	4.53	5.17		
w by s	4.04	4.27	4.50	5.14	5.39						
Weſt	6.00										
⊙ ſet	6.00	5.56	5.52	5.48	5.44	5.40	5.36	5.32	5.28	5.25	5.22

A Sun-Dial for the Latitude of 22 Degrees.

NORTH DECLINATION.

Deg. Min.	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	Deg. Min.	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	Point	h m	h m
South	12	12	12	12	12	12	12	12	North	12	12
s by w	0.15	0.13	0.11	0.09	0.08	0.06	0.04	0.02	n by w	Zen. West	0.01
s s w	0.31	0.28	0.24	0.20	0.16	0.12	0.08	0.04	n n w		0.03
sw by s	0.50	0.44	0.38	0.32	0.25	0.19	0.13	0.06	nw by n		0.04
s w	1.14	1.05	0.56	0.47	0.38	0.29	0.19	0.08	n w		0.07
sw by w	1.45	1.33	1.20	1.08	0.55	0.41	0.27	0.13	nw by w		0.10
w s w	2.32	2.15	1.58	1.40	1.22	1.03	0.42	0.20	w n w		0.17
w by s	3.46	3.24	3.01	2.38	2.12	1.45	1.14	0.37			
Weſt	5.35	5.10	4.44	4.17	3.47	3.14	2.35	1.43			
w by n					5.56	5.28	4.58	4.21			
⊙ ſet	6.04	6.08	6.12	6.16	6.21	6.25	6.29	6.34	⊙ ſet	6.37	6.40
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	Sun's	d m	d m
Ampl.	2.42	5.23	8.05	10.48	13.30	16.13	18.55	21.39	Ampl.	23.50	25.29

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.17	0.19	0.21	0.23	0.25	0.27	0.28	0.30	0.32	0.34	0.35
s s w	0.35	0.39	0.43	0.47	0.50	0.55	0.59	1.03	1.07	1.11	1.13
sw by s	0.56	1.02	1.08	1.14	1.21	1.27	1.33	1.40	1.47	1.52	1.57
s w	1.22	1.31	1.40	1.49	1.58	2.07	2.16	2.25	2.36	2.44	2.51
sw by w	1.57	2.09	2.21	2.34	2.46	2.59	3.13	3.27	3.42	3.54	4.04
w s w	2.49	3.05	3.22	3.39	3.57	4.15	4.34	4.55	5.17		
w by s	4.08	4.30	4.52	5.15	5.39						
Weſt	6.00										
⊙ ſet	6.00	5.56	5.52	5.48	5.44	5.39	5.35	5.31	5.26	5.23	5.20

A Sun-Dial for the Latitude of 23 Degrees.

NORTH DECLINATION.

Deg. Min.	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	Deg. Min.	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	Point	h m
South	12	12	12	12	12	12	12	12	12	North	12
s by w	0.16	0.14	0.12	0.11	0.09	0.07	0.05	0.03	0.01	n by w	0.00
s s w	0.33	0.30	0.26	0.22	0.18	0.14	0.10	0.05	0.02	n n w	0.01
w by s	0.53	0.47	0.41	0.34	0.28	0.22	0.16	0.09	0.03	nw by n	0.01
s w	1.17	1.08	1.00	0.50	0.41	0.32	0.23	0.13	0.04	n w	0.02
w by w	1.49	1.37	1.25	1.13	1.00	0.47	0.33	0.19	0.06	nw byw	0.03
w s w	2.37	2.21	2.04	1.47	1.29	1.11	0.51	0.29	0.10	w n w	0.06
w by s	3.51	3.30	3.08	2.45	2.21	1.55	1.26	0.54	0.20		
Weſt	5.36	5.12	4.48	4.22	3.54	3.23	2.48	2.04	1.11		
w by n				6.21	5.57	5.31	4.02	4.29	3.56		
⊙ ſet	6.04	6.09	6.13	6.17	6.22	6.26	6.31	6.36	6.39	⊙ ſet	6.42
Sun's Ampl.	d m 2.42	d m 5.26	d m 8.10	d m 10.52	d m 13.36	d m 16.20	d m 19.4	d m 21.49	d m 24.1	Sun's Ampl.	d m 25.41

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.18	0.20	0.22	0.24	0.26	0.28	0.29	0.31	0.33	0.35	0.36
s s w	0.37	0.41	0.44	0.48	0.51	0.56	1.00	1.04	1.08	1.12	1.15
sw by s	0.59	1.04	1.10	1.16	1.23	1.29	1.35	1.42	1.49	1.54	1.59
s w	1.25	1.34	1.43	1.51	2.01	2.10	2.19	2.28	2.38	2.46	2.53
sw by w	2.01	2.13	2.25	2.37	2.50	3.02	3.16	3.29	3.44	3.56	4.06
w s w	2.53	3.10	3.26	3.43	4.00	4.17	4.36	4.56	5.17		
w by s	4.12	4.33	4.54	5.16	5.39						
Weſt	6.00										
⊙ ſet	6.00	5.56	5.51	5.47	5.43	5.38	5.34	5.29	5.24	5.21	5.18

A Sun-Dial for the Latitude of 24 Degrees.

NORTH DECLINATION.

Deg. Min.	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	21	12	12	12	12	12	12
s by w	0.17	0.15	0.13	0.11	0.09	0.08	0.06	0.04	0.02	0.00
s s w	0.35	0.31	0.27	0.23	0.19	0.15	0.11	0.07	0.04	0.01
sw by s	0.55	0.49	0.43	0.37	0.30	0.24	0.18	0.11	0.06	0.01
s w	1.20	1.12	1.03	0.53	0.44	0.35	0.27	0.17	0.09	0.02
sw by w	1.54	1.42	1.30	1.18	1.05	0.52	0.39	0.24	0.13	0.03
w s w	2.42	2.26	2.10	1.53	1.36	1.18	0.59	0.38	0.20	0.05
w by s	3.56	3.35	3.14	2.52	2.29	2.05	1.38	1.07	0.38	0.10
Weſt	5.37	5.15	4.51	4.27	4.01	3.32	3.00	2.21	1.39	0.50
w by n				6.21	5.58	5.33	5.06	4.35	4.06	3.39
w n w									6.24	6.09
⊙ ſet	6.04	6.09	6.13	6.18	6.23	6.27	6.32	6.37	6.41	6.44
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Ampl.	2.44	5.28	8.13	10.57	13.47	16.27	19.13	21.59	24.12	25.54

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.18	0.20	0.22	0.24	0.26	0.28	0.29	0.31	0.33	0.35	0.37
s s w	0.38	0.42	0.46	0.50	0.53	0.57	1.01	1.05	1.10	1.13	1.16
sw by s	1.01	1.07	1.13	1.19	1.25	1.31	1.37	1.44	1.50	1.56	2.00
s w	1.29	1.37	1.46	1.54	1.04	2.13	2.21	2.31	2.40	2.48	2.55
sw by w	2.05	2.17	2.29	2.41	2.53	3.05	3.18	3.32	3.46	3.58	4.08
w s w	2.58	3.14	3.30	3.46	4.02	4.20	4.38	4.57	5.18		
w by s	4.16	4.36	4.56	5.17	5.39						
Weſt	6.00										
⊙ ſet	6.00	5.56	5.51	5.47	5.42	5.37	5.33	5.28	5.23	5.19	5.16

A Sun-Dial for the Latitude of 25 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.19	0.17	0.16	0.14	0.12	0.10	0.08	0.06	0.04	0.02	0.01
s s w	0.40	0.36	0.32	0.29	0.25	0.21	0.17	0.13	0.09	0.05	0.03
s w by s	1.03	0.57	0.51	0.45	0.39	0.33	0.27	0.21	0.14	0.09	0.04
s w	1.32	1.23	1.15	1.06	0.57	0.49	0.40	0.31	0.21	0.13	0.06
sw by w	2.09	1.58	1.46	1.35	1.22	1.10	0.58	0.44	0.31	0.19	0.10
w s w	3.02	2.47	2.32	2.16	2.00	1.43	1.25	1.07	0.47	0.29	0.15
w by s	4.19	4.00	3.40	3.20	2.59	2.37	2.14	1.48	1.19	0.53	0.29
Weſt	6.00	5.38	5.17	4.54	4.31	4.06	3.40	3.10	2.35	2.00	1.24
w by n					6.21	5.59	5.36	5.10	4.41	4.14	3.50
w n w										6.25	6.10
⊙ ſet	6.00	6.05	6.09	6.14	6.19	6.24	6.29	6.34	6.39	6.43	6.47
Sun's Ampl.	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
	0.00	2.45	5.31	8.16	11.3	13.49	16.35	19.22	22.10	24.24	26.8

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.19	0.21	0.23	0.25	0.27	0.28	0.30	0.32	0.34	0.36	0.37
s s w	0.40	0.43	0.47	0.51	0.55	0.59	1.02	1.06	1.10	1.14	1.17
sw by s	1.03	1.09	1.15	1.21	1.27	1.33	1.39	1.46	1.52	1.58	2.02
s w	1.32	1.40	1.48	1.57	2.06	2.15	2.23	2.33	2.42	2.50	2.57
sw by w	2.09	2.21	2.32	2.44	2.56	3.08	3.21	3.34	3.48	4.00	4.09
w s w	3.02	3.18	3.33	3.49	4.05	4.22	4.39	4.58	5.19		
w by s	4.19	4.39	4.58	5.18	5.39						
Weſt	6.00										
⊙ ſet	6.00	5.55	5.51	5.46	5.41	5.36	5.31	5.26	5.21	5.17	5.13

A Sun-Dial for the Latitude of 26 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.20	0.18	0.16	0.14	0.13	0.11	0.09	0.07	0.05	0.03	0.02
s s w	0.41	0.38	0.34	0.30	0.26	0.23	0.19	0.15	0.11	0.07	0.04
sw by s	1.05	0.59	0.54	0.48	0.42	0.36	0.30	0.24	0.17	0.11	0.07
s w	1.35	1.26	1.18	1.10	1.01	0.51	0.43	0.34	0.25	0.17	0.11
sw by w	2.13	2.02	1.50	1.39	1.27	1.15	1.03	0.50	0.36	0.25	0.16
w s w	3.07	3.52	2.37	2.21	2.06	1.49	1.32	1.14	0.55	0.38	0.25
w by s	4.22	4.04	3.45	3.25	3.06	2.46	2.23	1.58	1.31	1.07	0.45
Weſt	6.00	5.39	5.19	4.57	4.35	4.12	3.47	3.19	2.47	2.16	1.47
w b n					6.21	6.00	5.38	5.13	4.46	4.22	4.00
w n w									6.42	6.25	6.12
⊙ ſet	6.00	6.05	6.10	6.15	6.20	6.25	6.30	6.35	6.41	6.45	6.49
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Ampl.	0.00	2.46	5.33	8.21	11.8	13.56	16.44	19.33	22.22	24.37	26.23

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.20	0.20	0.24	0.25	0.27	0.29	0.31	0.33	0.35	0.36	0.38
s s w	0.41	0.45	0.49	0.52	0.56	1.00	1 04	1.08	1.12	1.15	1.18
sw by s	1.05	1.11	1.17	1.23	1.29	1.35	1.41	1.47	1.54	1.59	2.03
s w	1.35	1.43	1.51	2.00	2.08	2.17	2.26	2.35	2.44	2.52	2.59
sw by w	2.13	2.24	2.36	2.47	2.59	3.11	3.23	3.36	3.50	4.01	4.10
w s w	3.07	3.21	3.37	3.52	4.08	4.24	4.41	4.59	5.18		
w by s	4.22	4.41	5.00	5.19	5.39						
Weſt	6.00										
⊙ ſet	6.00	5.55	5.50	5.45	5.40	5 35	5.30	5.25	5.19	5.15	5.11

A Sun-Dial for the Latitude of 27 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.21	0.19	0.17	0.15	0.13	0.12	0.10	0.08	0.06	0.04	0.03
s s w	0.43	0.39	0.35	0.32	0.28	0.24	0.20	0.17	0.12	0.09	0.00
s w by s	1.07	1.02	0.56	0.50	0.45	0.39	0.33	0 27	0.20	0.13	0.10
s w	1.38	1.30	1.21	1.13	1.05	0.55	0.47	0.38	0.29	0.21	0.15
sw by w	2.17	2.06	1.55	1.43	1.32	1.20	1.08	0.55	0.42	0.32	0.23
w s w	3.10	2.56	2.41	2.20	2.11	1.55	1.39	1.22	1.03	0.47	0.34
w by s	4.25	4.07	3.49	3.31	3.11	2.51	2.31	2.07	1.42	1.19	0 59
Weſt	6.00	5.40	5.21	5.00	4.39	4.17	3.53	3.27	2.58	2.30	2.05
w by n					6.21	6.01	5.39	5.17	4.51	4.28	4.09
w n w									0.42	6.26	6.13
⊙ ſet	6.00	6.05	6.10	6.15	6.21	6.26	6.31	6.37	6.43	6.48	6.51
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Ampl.	0.00	2.48	5.37	8.25	11.14	14.03	16.53	19.43	22.34	24.51	26.37

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.21	0.22	0.24	0.26	0.28	0.30	0.32	0.34	0.36	0.37	0.38
s s w	0.43	0.46	0.50	0.53	0.57	1.01	1.05	1.09	1.13	1.16	1.19
sw by s	1.07	1.13	1.19	1.25	1.30	1.36	1.42	1.48	1.55	2.01	2.05
s w	1.38	1.46	1.54	2.02	2.11	2.19	2.28	2.37	2.46	2.54	3.00
sw by w	2.17	2.28	2.39	2.50	3.02	3.13	3.26	3.38	3.52	4.02	4.10
w s w	3.10	3.25	3.40	3.54	4.10	4.25	4.42	4.59	5.18		
w by s	4.25	4.43	5.02	5.20	5.39						
Weſt	6.00										
⊙ ſet	6.00	5.55	5.50	5.45	5.39	5.34	5.29	5.23	5.17	5.12	5.09

A Sun-Dial for the Latitude of 28 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.21	0.20	0.18	0.16	0.14	0.13	0.11	0.09	0.07	0.05	0.04
s s w	0.44	0.40	0.37	0.33	0.30	0.26	0.22	0.18	0.14	0.11	0.08
sw by s	1.10	1.04	0.58	0.53	0.47	0.41	0.35	0.29	0.22	0.16	0.13
s w	1.41	1.33	1.25	1.17	1.08	1.00	0.51	0.42	0.33	0.25	0.19
sw by w	2.20	2.10	1.59	1.48	1.36	1.25	1.13	1.01	0.48	0.37	0.28
w s w	3.14	3.00	2.46	2.31	2.17	2.01	1.45	1.28	1.11	0.55	0.43
w by s	4.28	4.11	3.53	3.36	3.17	2.58	2.38	2.16	1.52	1.31	1.13
Weſt	6.00	5.41	5.22	5.03	4.43	4.21	3.59	3.35	3.07	2.42	2.20
w b n					6.21	6.02	5.41	5.20	4.56	4.34	4.16
w n w									6.42	6.27	6.14
⊙ ſet	6.00	6.05	6.11	6.16	6.22	6.27	6.33	6.39	6.45	6.50	6.53
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Ampl.	0.00	2.50	5.40	8.30	11.21	14.11	17.3	19.54	22.48	25.6	26.52

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.21	0.23	0.25	0.27	0.28	0.30	0.32	0.34	0.36	0.38	0.39
s s w	0.44	0.48	0.51	0.55	0.58	1.02	1.06	1.10	1.14	1.17	1.20
sw by s	1.10	1.15	1.21	1.27	1.32	1.38	1.44	1.51	1.57	2.03	2.06
s w	1.41	1.49	1.57	2.05	2.13	2.21	2.30	2.39	2.47	2.56	3.02
sw by w	2.20	2.31	2.42	2.53	3.04	3.16	3.28	3.40	3.53	4.04	4.13
w s w	3.14	3.28	3.43	3.57	4.12	4.27	4.44	5.00	5.18		
w by s	4.28	4.45	5.03	5.21	5.39						
Weſt	6.00										
⊙ ſet	6.00	5.55	5.49	5.44	5.38	5 33	5.27	5.21	5.15	5.10	5.07

A Sun-Dial for the Latitude of 29 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.22	0.20	0.19	0.17	0.15	0.13	0.11	0.10	0.08	0.06	0.05
s s w	0.45	0.42	0.38	0.35	0.31	0.27	0.23	0.19	0.16	0.12	0.10
sw by s	1.12	1.06	1.01	0.55	0.49	0.43	0.37	0.31	0.25	0.20	0.16
s w	1.43	1.36	1.28	1.20	1.12	1.03	0.55	0.46	0.37	0.29	0.23
sw by w	2.23	2.13	2.03	1.52	1.41	1.30	1.18	1.06	0.53	0.42	0.34
w s w	3.18	3.04	2.50	2.36	2.22	2.07	1.52	1.35	1.18	1.03	0.51
w by s	4.31	4.14	3.57	3.40	3.22	3.05	2.45	2.24	2.01	1.41	1.24
Weſt	6.00	5.42	5.24	5.05	4.46	4.26	4.04	3.41	3.16	2.53	2.33
w by n					6.21	6.02	5.43	5.22	5.00	4.40	4.23
w n w									6.42	6.27	6.15
⊙ ſet	6.00	6.06	6.11	6.17	6.23	6.28	6.34	6.40	6.47	6.52	6.55
Sun's	d m	d m	d m	d m	d m	d m	d	d m	d m	d m	d m
Ampl.	0.00	2.51	5.43	8.35	11.27	14.19	17.12	20.6	23.2	25.22	27.8

SOUTH DECLINATION

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.22	0.24	0.26	0.27	0.29	0.31	0.33	0.35	0.37	0.38	0.39
s s w	0.45	0.49	0.53	0.56	1.00	1.04	1.08	1.11	1.15	1.18	1.21
sw by s	1.12	1.17	1.23	1.29	1.34	1.40	1.46	1.52	1.59	2.04	2.08
s w	1.43	1.51	1.59	2.07	2.15	2.24	2.32	2.41	2.49	2.58	3.04
sw by w	2.23	2.34	2.45	2.56	3.07	3.18	3.30	3.42	3.55	4.05	4.14
w s w	3.18	3.32	3.46	4.00	4 14	4.29	4.44	5.00			
w by s	4.31	4.48	5.04	5.22	5.39						
Weſt	6.00										
⊙ ſet	6.00	5.54	5.49	5.43	5.37	5.32	5.26	5.20	5.13	5.08	[illegible]

A Sun-Dial for the Latitude of 30 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.23	0.21	0.19	0.18	0.16	0.14	0.12	0.10	0.08	0.07	0.06
s s w	0.47	0.43	0.40	0.36	0.33	0.29	0.25	0.21	0.17	0.14	0.12
sw by s	1.14	1.08	1.03	0.58	0.52	0.46	0.40	0.34	0.28	0.23	0.19
s w	1.46	1.38	1.31	1.23	1.15	1.07	0.58	0.50	0.41	0.33	0.27
sw by w	2 27	2.17	2.06	1.56	1.45	1.34	1.23	1.11	0.58	0.48	0.40
w s w	3 21	3.08	2.55	2.41	2.27	2.13	1.58	1.42	1.25	1.11	0.59
w by s	4.33	4.17	4.01	3.44	3.27	3.10	2.51	2.31	2.10	1.51	1.35
Weſt	6.00	5.43	5.25	5.07	4.49	4.30	4.09	3.48	3.24	3.02	2.44
w by n					6.21	6.03	5.45	5.25	5.03	4.45	4.29
w n w									6.42	6.2[illegible]	6.17
⊙ ſet	6.00	6.06	6.12	6.18	6.23	6.29	6.36	6.42	6.48	6.54	6.58
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Ampl.	00.0	2.53	5.46	8.40	11.34	14.28	17.23	20.18	23.16	25.38	27.25

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.23	0.24	0.26	0.28	0.30	0.31	0.33	0.35	0.37	0.39	0.40
s s w	0.47	0.50	0.54	0.57	1.01	1.05	1.09	1.12	1.16	1.19	1.22
sw by s	1.14	1.19	1.25	1.30	1.36	1.42	1.48	1.54	2.00	2.05	2.09
s w	1.46	1.54	2.02	2.10	2.18	2.26	2.34	2.43	2.50	2 59	3.05
sw by w	2.27	2.38	2.48	2.58	3.09	3.20	3.32	3.44	3.56	4.06	4.14
w s w	3.21	3.35	3.48	4.02	4.16	4.30	4.45	5.01			
w by s	4.33	4.49	5.05	5.22	5.39						
Weſt	6.00										
⊙ ſet	6.00	5.54	5.48	5.42	5.37	5.31	5.24	5.18	5.12	5.06	5.02

A Sun-Dial for the Latitude of 31 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.23	0.22	0.20	0.18	0.17	0.15	0.13	0.11	0.09	0.08	0.07
s s w	0.48	0.45	0.41	0.38	0.34	0.31	0.27	0.23	0.19	0.16	0.13
sw by s	1.16	1.11	1.05	1.00	0.54	0.48	0.43	0.37	0.31	0.25	0.21
s w	1.49	1.41	1.34	1.26	1.18	1.10	1.02	0.53	0.45	0.37	0.32
sw by w	2.30	2.20	2.10	2.00	1.49	1.38	1.27	1.16	1.04	0.54	0.46
w s w	3.25	3.12	2.59	2.45	2.32	2.18	2.03	1.48	1.32	1.18	1.07
w by s	4.36	4.20	4.04	3.48	3.32	3.15	2.57	2.38	2.18	2.00	1.46
Weſt	6.00	5.43	5.26	5.09	4.52	4.33	4.14	3.53	3.31	3.11	2.55
w by n					6.21	6.04	5.46	5.27	5.07	4.49	4.35
w n w									6.43	6.29	6.18
⊙ ſet	6.00	6.06	6.12	6.18	6.24	6.31	6.37	6.44	6.51	6.56	7.01
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Ampl.	0.00	2.55	5.50	8.46	11.41	14.37	17.34	20.31	23.31	25.55	27.43

SOUTH DECLINATION

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.23	0.25	0.27	0.28	0.30	0.32	0.34	0.36	0.38	0.39	0.40
s s w	0.48	0.52	0.55	0.59	1.02	1.06	1.10	1.13	1.17	1.20	1.23
sw by s	1.16	1.21	1.27	1.32	1.38	1.44	1.49	1.55	2.01	2.07	2.11
s w	1.49	1.57	2.04	2.12	2.20	2.28	2.36	2.45	2.52	3.01	3.06
sw by w	2.30	2.41	2.51	3.01	3.12	3.33	3.34	3.45	3.57	4.07	4.15
w s w	3.25	3.38	3.51	4.04	4 18	4.32	4.46	5.01			
w by s	4.36	4.50	5.07	5.23							
Weſt	6.00										
⊙ ſet	6.00	5.54	5.48	5.42	5.36	5.29	5.23	5.16	5.09	5.04	4.59

A Sun-Dial for the Latitude of 32 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.24	0.22	0.21	0.19	0.17	0.16	0.14	0.12	0.10	0.09	0.07
s s w	0.50	0.46	0.43	0.39	0.36	0.32	0.29	0.25	0.21	0.18	0.15
sw by s	1.18	1.13	1.07	1.02	0.56	0.51	0.45	0.39	0.33	0.28	0.24
s w	1.52	1.44	1.37	1.29	1.22	1.14	1.05	0.57	0.49	0.41	0.36
sw by w	2.34	2.24	2.14	2.04	1.54	1.43	1.32	1.21	1.09	0.59	0.51
w s w	3.28	3.15	3.03	2.50	2.37	2.23	2.09	1.54	1.39	1.25	1.15
w by s	4.38	4.23	4.08	3.52	3.37	3.20	3.03	2.45	2.26	2.09	1.55
Weſt	6.00	5.44	5.28	5.11	4.55	4.37	4.19	3.59	3.38	3.19	3.04
w by n					6.21	6.05	5.48	5.30	5.10	4.53	4.39
w n w									6.43	6.30	6.19
⊙ ſet	6.00	6.06	6.13	6.19	6.25	6.32	6.39	6.46	6.53	6.58	7.03
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Ampl.	00.0	2.57	5.54	8.51	11.48	14.47	17.46	20.45	23.47	26.13	28.3

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.24	0.26	0.27	0.29	0.31	0.32	0.34	0.36	0.38	0.40	0.41
s s w	0.50	1.53	0.56	1.00	1.03	1.07	1.11	1.14	1.18	1.21	1.24
sw by s	1.18	1.23	1.29	1.34	1.40	1.45	1.50	2.57	2.03	2.08	2.12
s w	1.52	2.59	2.07	2.14	2.22	2.30	2.38	2.47	2.53	3 02	3.08
sw by w	2.34	2.44	2.54	3.04	3.14	3.25	3.35	3.47	3.59	4.08	4.16
w s w	3.28	3.41	3.53	4.06	4.19	4.33	4.47	5.02			
w by s	4.38	4.53	5.08	5.23							
Weſt	6.00										
⊙ ſet	6.00	5.54	5.47	5.41	5.35	5.28	5.21	5.14	5.07	5 02	4.57

A Sun-Dial for the Latitude of 33 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d –	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.25	0.23	0.21	0.20	0.18	0.16	0.15	0.13	0.11	0.09	0.08
s s w	0.51	0.47	0.44	0.41	0.37	0.34	0.30	0 27	0.23	0.19	0.17
sw by s	1.20	1.15	1.09	1.04	0.59	0.53	0.48	0.42	0.36	0.31	0.27
s w	1.54	1.47	1.40	1.32	1.25	1.17	1.09	1.01	0.53	0.46	0.40
sw by w	2.37	2.27	2.17	2.07	1.57	1.47	1.36	1.25	1.14	1.04	0.57
w s w	3.31	3.19	3.06	2.54	2.41	2.28	2.14	2.00	1.45	1.32	1.22
w by s	4.40	4.25	4.11	3.56	3 41	3.25	3.09	2.51	2.33	2.17	2.04
Weſt	6.00	5.45	5.29	5.13	4.57	4.40	4.23	4.04	3.44	3.26	3.12
w by n					6.21	6.05	5.49	5.32	5.13	4.57	4.44
w n w.									6.43	6.30	6.20
☉ ſet	6.00	6.07	6.13	6.20	6.26	6.33	6.40	6.47	6.55	7.01	7.06
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Ampl.	0.00	2.59	5.58	8.57	11.55	14.57	17.58	21.0	24.4	26.32	28.22

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.25	0.26	0.28	0.30	0.31	0.33	0.35	0.37	0.39	0.40	0.41
s s w	0.51	0.54	0.58	1.01	1.05	1.08	1.12	1.15	1.19	1.22	1.25
sw by s	1.20	1.25	1.30	1.36	1.41	1.47	1.52	1.58	2.04	2.09	2.13
s w	1.54	2.02	2.09	2.17	2.24	2.32	2.40	2.48	2.55	3.04	3.10
sw by w	2.37	2.46	2.56	3.06	3.16	3.27	3.37	3.48	4.00	4.09	4.17
w s w	3.31	3.43	3.56	4.08	4.21	4.34	4.48	5.02			
w by s	4.40	4.54	5.09	5.24							
Weſt	6.00										
☉ ſet	6.00	5.53	5.47	5.40	5.34	5.27	5.20	5.13	5.05	4.59	4.54

A Sun-Dial for the Latitude of 34 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.25	0.24	0.22	0.20	0.19	0.17	0.15	0.14	0.12	0.10	0.09
s s w	0.52	0.49	0.45	0.42	0.39	0.35	0.32	0.28	0.24	0.21	0.19
s w by s	1.22	1.17	1.12	1.07	1.01	0.56	0.50	0.44	0.38	0.34	0.30
s w	1.57	1.00	1.42	1.35	1.28	1.20	1.12	1.04	0.56	0.49	0.44
sw byw	2.40	2.30	2.21	2.11	2.01	1.51	1.41	1.30	1.19	1.09	1.02
w s w	3.34	3.22	3.10	2.58	2.45	2.33	2.19	2.06	1.51	1.39	1.29
w by s	4.42	4.28	4.14	3.59	3.45	3.30	3.14	2.57	2.40	2.24	2.12
Weſt	6.00	5.45	5.30	5.15	5.00	4.43	4.26	4.09	3.49	3.33	3.19
w by n					6.21	6.06	5.50	5.34	5.16	5.01	4.49
w n w									6.43	6.31	6.21
☉ ſet	6.00	6.07	6.14	6.20	6.27	6.34	6.42	6.49	6.57	7.03	7.08
Sun's Ampl.	d m 0.00	d m 3.08	d m 6.02	d m 9.03	d m 12.3	d m 15.8	d m 18.11	d m 21.16	d m 24.22	d m 26.52	d m 28.45

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.25	0.27	0.29	0.30	0.32	0.34	0.35	0.37	0.39	0.41	0.42
s s w	0.52	0.55	0.59	1.02	1.06	1.09	1.13	1.16	1.20	1.23	1.26
sw by s	1.22	1.27	1.32	1.38	1.43	1.48	1.54	2.00	2.05	2.10	2.14
s w	1.57	2.04	2.11	2.19	2.26	2.34	2.42	2.50	2.57	3.05	3.10
sw byw	2.40	2.49	2.59	3.09	3.18	3.28	3.39	3.50	4.01	4.10	4.18
w s w	3.34	3.46	3.58	4.10	4.22	4.35	4.48	5.02			
w by s	4.42	4.56	5.10	5.24							
Weſt	6.00										
☉ ſet	6.00	5.53	5.46	5.40	5.33	5.26	5.18	5.11	5.03	4.57	4.52

A Sun-Dial for the Latitude of 35 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.26	0 24	0.23	0.21	0.19	0.18	0.16	0.14	0.13	0.11	0.10
s s w	0.53	0.50	0.47	0.44	0.40	0 37	0 33	0.30	0.26	0.23	0.20
sw by s	1.24	1.19	1.15	1.09	1.03	0.58	0.52	0.47	0 41	0.36	0.32
s w	1.49	1.52	1.44	1.38	1.31	1.23	1 15	1.08	0.59	0.53	0.47
sw by w	2.43	2.33	2.24	2.14	2.05	1.55	1.45	1.34	1.23	1.14	1.07
w s w	3.37	3.25	3.13	3.02	2.50	2.37	2.24	2.11	1.57	1.45	1.36
w by s	4.43	4.30	4.16	4.03	3 48	3.34	3.19	3.03	2.46	2.31	2.20
Weſt	6.00	5.46	5.31	5.17	5.02	4.46	4.30	4.13	3.55	3.39	3.26
w by n					6.21	6.07	5.52	5.36	5.19	5.04	4.53
w n w									6.44	6.32	6.22
☉ ſet	6.00	6.07	6.14	6.21	6.28	6.35	6.43	6.51	6.59	7.06	7.11
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Ampl.	0.00	3.03	6.06	9.10	12.12	15.19	18.25	21.32	24.41	27.13	29.5

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.26	0.28	0.29	0.31	0.33	0.34	0.36	0.38	0.40	0.41	0.42
s s w	0.53	0.57	1.00	1.04	1.07	1.10	1.14	1.17	1.21	1.24	1.27
sw by s	1.24	1.29	1.34	1.39	1.45	1.50	1.55	2.01	2.07	2.12	2.15
s w	1.59	2.06	2.14	2.21	2.28	2.36	2.43	2.51	2.59	3.06	3.11
sw by w	2.43	2.52	3.01	3.11	3.20	3.30	3.40	3.51	4.02	4.11	4.18
w s w	3.37	3.48	4.00	4.12	4.24	4.36	4.49	5.02			
w by s	4 43	4.57	5.11	5.24							
Weſt	6.00										
☉ ſet	6.00	5.53	5.46	5.39	5.32	5.25	5.17	5.09	5.01	4.54	4.49

A Sun-Dial for the Latitude of 36 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.27	0.25	0.23	0.22	0.20	0.19	0.17	0.15	0.13	0.12	0.11
s s w	0.55	0.51	0.48	0.45	0.42	0.38	0.35	0.31	0.28	0.24	0.22
s w by s	1.26	1.21	1.16	1.11	1.05	1.00	0.55	0.49	0.44	0.39	0.35
s w	2.02	1.55	1.48	1.41	1.34	1.26	1.19	1.11	1.03	0.56	0.51
sw byw	2 45	2.36	2.27	2.18	2.08	1.59	1.49	1.39	1.28	1.19	1.12
w s w	3.39	3.28	3.17	3.05	2.53	2.41	2.29	2.16	2.03	1.51	1.42
w by s	4.45	4.32	4.19	4.06	3.52	3.38	3.23	3.08	2.52	2.38	2.27
Weſt	6 00	5.46	5.32	5.18	5.04	4.49	4.33	4.17	4.00	3.45	3.33
w by n					6.22	6.08	5.53	5.38	5.22	5.08	4.57
w n w									6.44	6.33	6.24
⊙ ſet	6.00	6.07	6.15	6.22	6.29	6.37	6.45	6.53	7.01	7.08	7.14
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Ampl.	0.00	3.06	6.11	9.17	12.24	15.31	18.40	21.49	25.0	27.35	29.32

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.27	0.28	0.30	0.31	0.33	0.35	0.36	0.38	0.40	0.41	0.43
s s w	0.55	0.58	1.01	1.05	1.08	1.11	1.15	1.18	1.22	1.25	1.27
sw by s	1.26	1.31	1.36	1.41	1.46	1.51	1.57	2.02	2.08	2.13	2.16
s w	2.02	2.09	2.16	2.23	2.30	2.37	2.45	2.53	3.01	3.07	3.12
sw byw	2.45	2.54	3.04	3.13	3.22	3.32	3.42	3.52	4.03	4.12	4.18
w s w	3.39	3.51	4.02	4.13	4.25	4.37	4.49	5.02			
w by s	4.45	4.58	5.11	5.25							
Weſt	6.00										
⊙ ſet	6.00	5.53	5.45	5.38	5.31	5.23	5.15	5.07	4.59	4.52	4.46

A Sun-Dial for the Latitude of 37 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.27	0.26	0.24	0.23	0.21	0.19	0.18	0.16	0.14	0.13	0.12
s s w	0.56	0.53	0.50	0.46	0.43	0.40	0.36	0.33	0.29	0.26	0.24
sw by s	1.28	1.23	1.18	1.13	1.08	1.02	0.57	0.52	0.47	0.41	0.38
s w	2.04	1.57	1.50	1.43	1.36	1.29	1.22	1.14	1.07	1.00	0.55
sw by w	2.48	2.39	2.30	2.21	2.12	2.03	1.53	1.43	1.33	1.24	1.17
w s w	3.42	3.31	3.20	3.09	2.57	2.46	2.34	2.21	2.08	1.57	1.48
w by s	4.47	4.34	4.21	4.09	3.56	3.42	3.28	3.13	2.58	2.45	2.34
Weſt	6.00	5.47	5.33	5.19	5.06	4.52	4.37	4.21	4.05	3.50	3.39
w by n					6.22	6.08	5.54	5.40	5.24	5.11	5.00
w n w									6.44	6.33	6.25
☉ ſet	6.00	6.08	6.15	6.23	6.31	6.39	6.47	6.55	7.04	7.11	7.17
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Ampl.	0.00	3.08	6.16	9.25	12.32	15.44	18.55	22.8	25.21	27.58	29.58

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.27	0.29	0.31	0.32	0.34	0.35	0.37	0.39	0.41	0.42	0.43
s s w	0.56	0.59	1.02	1.06	1.09	1.12	1.16	1.19	1.23	1.26	1.28
sw by s	1.28	1.33	1.37	1.42	1.47	1.53	1.58	2.04	2.09	2.14	2.17
s w	2.04	2.11	2.18	2.25	2.32	2.39	2.46	2.54	3.02	3.08	3.13
sw by w	2.48	2.57	3.06	3.15	3.24	3.33	3.43	3.53	4.03	4.12	4.19
w s w	3.42	3.53	4.04	4.15	4.26	4.38	4.50	5.02			
w by s	4.47	5.00	5.12	5.25							
Weſt	6.00										
☉ ſet	6.00	5.52	5.45	5.37	5.29	5.21	5.13	5.05	4.56	4.49	4.43

A Sun-Dial for the Latitude of 38 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	29m h m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	23 d
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.28	0.26	0.25	0.23	0.21	0.20	0.18	0.17	0.15	0.13	0.12
s s w	0.57	0.54	0.51	0.48	0.45	0.41	0.38	0.34	0.31	0.28	0.26
sw by s	1 29	1.24	1.20	1.15	1.10	1.05	1.00	0.54	0.49	0.44	0.41
s w	2.06	2.00	1.53	1.46	1.39	1.32	1.25	1.18	1.10	1.04	0.59
sw by w	2.51	2.42	2.33	2.24	2.15	2.06	1.57	1.47	1.37	1.29	1.22
w s w	3.44	3.34	3.23	3.12	3.01	2.50	2.39	2.26	2.13	2.03	1.54
w by s	4.48	4.36	4.24	4.12	4.00	3.46	3.33	3.18	3.03	2.50	2.40
Weſt	6.00	5.47	5.34	5.21	5.08	4.54	4.41	4.25	4.09	3.55	3.45
w by n					6.22	6.09	5.56	5.41	5.26	5.14	5.04
w n w									6.45	6.34	6.26
⊙ ſet	6.00	6.08	6.16	6.24	6.32	6.40	6.48	6.57	7.06	7.14	7.19
Sun's Ampl.	d m 00.0	d m 3.10	d m 6.21	d m 9.32	d m 12.43	d m 15.56	d m 19.11	d m 22.26	d m 25.43	d m 28.23	d m 30.24

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.28	0.30	0.31	0.33	0.34	0.36	0.38	0.39	0.41	0.42	0.44
s s w	0.57	1.00	1.04	1.07	1.10	1.13	1.16	1.20	1.24	1.27	1.29
sw by s	1.29	1.34	1.39	1.44	1.49	1.54	1.59	2.05	2.10	2.15	2.18
s w	2.06	2.13	2.20	2.27	2.34	2.41	2.48	2.55	3.03	3.09	3.14
sw by w	2.51	2.59	3.08	3.17	3.26	3.35	3.44	3.54	4.04	4.13	4.19
w s w	3.44	3.55	4.06	4.17	4.28	4.39	4.50	5.02			
w by s	4.48	5.00	5.13	5.25							
Weſt	6.00										
⊙ ſet	6.00	5.52	5.44	5.36	5.28	5.20	5.12	5.03	4.54	4.46	4.41

A Sun-Dial for the Latitude of 39 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.29	0.27	0.25	0.24	0.22	0.21	0.19	0.17	0.16	0.14	0.13
s s w	0.58	0.55	0.52	0.49	0.46	0.43	0.39	0.36	0.32	0.30	0.27
sw by s	1.31	1.26	1.22	1.17	1.12	1.07	1.02	0.57	0.51	0.47	0.43
s w	2.09	2.02	1.55	1.49	1.42	1.35	1.28	1.21	1.13	1.07	1.02
sw by w	2.53	2.45	2.36	2.27	2.19	2.10	2.01	1.51	1.41	1.33	1.27
w s w	3.47	3.36	3.26	3.15	3.05	2.54	2.42	2.31	2.18	2.08	2.00
w by s	4.50	4.38	4.26	4.14	4.02	3.49	3.36	3. 3	3.08	2.56	2.47
Weſt	6.00	5.48	5.35	5.22	5.10	4.56	4.43	4.28	4.13	4.00	3.50
w by n					6.22	6.10	5.57	5.43	5.29	5.16	5.07
w n w									6.45	6.35	6.27
⊙ ſet	6.00	6.08	6.16	6.24	6.32	6.41	6.50	6.59	7.09	7.16	7.22
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Ampl.	0.00	3.13	6.26	9.40	12.54	16.10	19.28	22.45	26.06	28.49	30.52

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.29	0.30	0.32	0.33	0.35	0.36	0.38	0.40	0.41	0.43	0.44
s s w	0.58	1.02	1.05	1.08	1.11	1.14	1.18	1.21	1.25	1.27	1.30
sw by s	1.31	1.36	1.41	1.46	1.51	1.56	2.01	2.06	2.11	2.16	2.19
s w	2.09	2.15	2.22	2.29	2.35	2.42	2.49	2.57	3.04	3.10	3.15
sw by w	2.53	3.02	3.10	3.19	3.27	3.36	3.46	3.55	4.05	4.13	4.20
w s w	3.47	3.57	4.08	4.18	4.29	4.39	4.51	5.03			
w by s	4.50	5.02	5.14	5.26							
Weſt	6.00										
⊙ ſet	6.00	5.52	5.44	5.36	5.28	5.19	5.10	5.01	4.51	4.44	4.38

A Sun-Dial for the Latitude of 40 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	29m h m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	23 d
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.29	0.28	0.26	0.24	0.23	0.21	0.20	0.18	0.17	0.15	0.14
s s w	1.00	0.57	0.53	0.50	0.47	0.44	0.41	0.37	0.34	0.31	0.29
sw by s	1.33	1.28	1.24	1.19	1.14	1.09	1.04	0.59	0.54	0.49	0.46
s w	2.11	2.04	1.58	1.51	1.45	1.38	1.31	1.24	1.17	1.11	1.06
sw by w	2.56	2.47	2.39	2.30	2.22	2.14	2.04	1.55	1.46	1.38	1.31
w s w	3.49	3.39	3.29	3.18	3.08	2.58	2.46	2.35	2.23	2.13	2.05
w by s	4.51	4.40	4.28	4.17	4.05	3.53	3.40	3.27	3.13	3.02	2.52
Weſt	6.00	5.48	5.36	5.23	5.11	4.59	4.46	4.32	4.17	4.01	3.55
w by n					6.22	6.11	5.58	5.45	5.38	5.19	5.10
w n w								6.58	6.46	6.36	6.28
☉ ſet	6.00	6.08	6.17	6.25	6.34	6.43	6.52	7.01	7.11	7.19	7.25
Sun's Ampl.	d m 00.0	d m 3.15	d m 6.32	d m 9.48	d m 13.6	d m 16.24	d m 19.45	d m 23.06	d m 26.30	d m 29.16	d m 31.22

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.29	0.31	0.32	0.34	0.35	0.37	0.38	0.40	0.42	0.43	0.44
s s w	1.00	1.03	1.06	1.09	1.12	1.15	1.18	1.22	1.25	1.28	1.30
sw by s	1.33	1.38	1.43	1.47	1.52	1.57	2.02	2.07	2.12	2.17	2.20
s w	2.11	2.17	2.24	2.31	2.37	2.44	2.51	2.58	3.05	3.11	3.16
sw by w	2.56	3.04	3.12	3.21	3.29	3.38	3.47	3.56	4.06	4.14	4.20
w s w	3.49	3.59	4.09	4.19	4.30	4.40	4.51	5.03			
w by s	4.51	5.03	5.14	5.26							
Weſt	6.00										
☉ ſet.	6.00	5.52	5.43	5.35	5.26	5.17	5.08	4.59	4.49	4.41	4.35

A Sun-Dial for the Latitude of 41 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.30	0.28	0.27	0.25	0.24	0.22	0.21	0.19	0.17	0.16	0.15
s s w	1.01	0.58	0.55	0.52	0.49	0.46	0.42	0.39	0.36	0.33	0.31
sw by s	1.35	1.30	1.25	1.21	1.16	1.11	1.06	1.01	0.56	0.52	0.48
s w	2.13	2.07	2.00	1.54	1.48	1.41	1.34	1.27	1.20	1.14	1.09
sw by w	2.58	2.50	2.42	2.33	2.25	2.17	2.08	1.59	1.50	1.42	1.36
w s w	3.51	3.41	3.31	3.21	3.11	3.01	2.50	2.39	2.28	2.18	2.11
w by s	4.53	4.42	4.30	4.19	4.08	3.57	3.44	3.31	3.18	3.07	2.58
Weſt	6.00	5.48	5.36	5.25	5.13	5.01	4.48	4.35	4.21	4.09	4.00
w by n					6.23	6.12	5.59	5.46	5.33	5.22	5.13
w n w								6.58	6.46	6.37	6.29
☉ ſet	6.00	6.09	6.17	6.26	6.35	6.44	6.54	7.04	7.14	7.22	7.29
Sun's Ampl.	d m 0.00	d m 3.18	d m 6.38	d m 9.57	d m 13.18	d m 16.40	d m 20.4	d m 23.29	d m 26.56	d m 29.45	d m 31.54

SOUTH DECLINATION

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.30	0.31	0.33	0.34	0.36	0.37	0.39	0.40	0.42	0.44	0.45
s s w	1.01	1.04	1.07	1.10	1.13	1.16	1.19	1.23	1.26	1.29	1.31
sw by s	1.35	1.39	1.44	1.49	1.53	1.58	2.03	2.08	2.13	2.18	2.21
s w	2.13	2.19	2.26	2.32	2 39	2.45	2.52	2.59	3.06	3.12	3.17
sw by w	2.58	3.06	3.14	3 22	3.31	3.39	3.48	3.57	4.06	4.14	4.20
w s w	3.51	4.01	4.11	4.21	4 30	4.40	4.51	5.03			
w by s	4.53	5.04	5.15	5.26							
Weſt	6.00										
☉ ſet	6.00	5.51	5.43	5.34	5.25	5.16	5.06	4.56	4.46	4.38	4.31

A Sun-Dial for the Latitude of 42 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.30	0.29	0.27	0.26	0.24	0.23	0.21	0.20	0.18	0.17	0.16
s s w	1.02	0.59	0.56	0.53	0.50	0.47	0.44	0.41	0.37	0.34	0.32
sw by s	1.36	1.32	1.27	1.23	1.18	1.13	1.09	1.04	0.58	0.54	0.51
s w	2.15	2.09	2.03	1.56	1.50	1.44	1.37	1.30	1.23	1.17	1.13
sw byw	3.00	2.52	2.44	2.36	2.28	2.20	2.12	2.03	1.54	1.46	1.40
w s w	3.53	3.43	3.34	3.24	3.15	3.05	2.54	2.44	2.33	2.23	2.16
w by s	4.54	4.43	4.32	4.21	4.10	4.00	3.48	3.36	3.23	3.12	3.03
Weſt	6.00	5.49	5.37	5.26	5.15	5.03	4.51	4.39	4.24	4.13	4.04
w by n					6.23	6.12	6.00	5.48	5.35	5.24	5.16
w n w								6.58	6.47	6.37	6.30
☉ ſet	6.00	6.09	6.18	6.27	6.37	6.46	6.56	7.06	7.17	7.25	7.32
Sun's Ampl.	d m 00.0	d m 3.21	d m 6.44	d m 10.6	d m 13.31	d m 16.56	d m 20.23	d m 23.52	d m 27.24	d m 30.16	d m 32.28

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.30	0.32	0.33	0.35	0.36	0.38	0.39	0.41	0.43	0.44	0.45
s s w	1.02	1.05	1.08	1.11	1.14	1.17	1.20	1.23	1.27	1.30	1.32
sw by s	1.36	1.41	1.46	1.50	1.55	1.59	2.04	2.09	2.14	2.19	2.22
s w	2.15	2.21	2.28	2.34	2.40	2.46	2.53	3.00	3.07	3.13	3.17
sw by w	3.00	3.08	3.16	3.24	3.32	3.40	3.49	3.57	4.07	4.14	4.20
w s w	3.53	4.02	4.12	4.22	4.31	4.41	4.52				
w by s	4.54	5.04	5.15	5.26							
Weſt	6.00										
☉ ſet	6.00	5.51	5.42	5.33	5.23	5.14	5.04	4.54	4.43	4.35	4.28

A Sun-Dial for the Latitude of 43 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.31	0.29	0.28	0.27	0.25	0.24	0.22	0.21	0.19	0.18	0.17
s s w	1.03	1.00	0.57	0.54	0.51	0.48	0.45	0.42	0.39	0.36	0.34
sw by s	1.38	1.34	1.29	1.25	1.20	1.15	1.11	1.06	1.01	0.57	0.53
s w	2.17	2.11	2.05	1.59	1.53	1.47	1.40	1.33	1.26	1.20	1.16
sw by w	3.02	2.55	2.47	2.39	2.31	2.23	2.15	2.07	1.58	1.50	1.44
w s w	3.55	3.46	3.36	3.27	3.18	3.08	2.58	2.48	2.37	2.28	2.21
w by s	4.55	4.45	4.34	4.23	4.13	4.03	3.52	3.40	3.27	3.17	3.09
Weſt	6.00	5.49	5.38	5.27	5.16	5.05	4.53	4.41	4.27	4.17	4.09
w by n					6.23	6.13	6.01	5.50	5.37	5.27	5.19
w n w								6.58	6.47	6.38	6.31
⊙ ſet	6.00	6.09	6.19	6.28	6.38	6.48	6.58	7.09	7.19	7.28	7.36
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Ampl.	0.00	3.25	6.51	10.17	13.44	17.13	20.43	24.16	27.53	30.48	33.03

SOUTH DECLINATION

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 2
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.31	0.32	0.34	0.35	0.37	0.38	0.40	0.41	0.43	0.44	0.45
s s w	1.03	1.06	1.09	1.12	1.15	1.18	1.21	1.24	1.27	1.30	1.32
sw by s	1.38	1.42	1.47	1.52	1.56	2.01	2.05	2.10	2.15	2.19	2.23
s w	2.17	2.23	2.29	2.36	2.42	2.48	2.54	3.01	3.08	3.14	3.18
sw by w	3.02	3.10	3.18	3.26	3.33	3.41	3.50	3.58	4.07	4.14	4.20
w s w	3.55	4.04	4.14	4.23	4 32	4.42	4.52				
w by s	4.55	5.05	5.16	5.26							
Weſt	6.00										
⊙ ſet	6.00	5.51	5.41	5.32	5.22	5.12	5.02	4.51	4.41	4.32	4.24

A Sun-Dial for the Latitude of 44 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.31	0.30	0.29	0.27	0.26	0.24	0.23	0.21	0.20	0.18	0.17
s s w	1.04	1.01	0.58	0.56	0.53	0.50	0.47	0.44	0.40	0.38	0.36
sw by s	1.40	1.35	1.31	1.27	1.22	1.18	1.13	1.08	1.03	0.59	0.56
s w	2.19	2.13	2.07	2.01	1.55	1.49	1.43	1.36	1.29	1.24	1.20
sw byw	3.04	2.57	2.49	2.42	2.34	2.26	2.18	2.10	2.01	1.54	1.49
w s w	3.57	3.48	3.38	3.29	3.21	3.12	3.02	2.52	2.41	2.33	2.26
w by s	4.56	4.46	4.36	4.26	4.16	4.05	3.54	3.43	3.31	3.21	3.13
Weſt	6.00	5.50	5.39	5.28	5.18	5.07	4.56	4.44	4.31	4.21	4.13
w by n					6.23	6.13	6.02	5.51	5.39	5.29	5.21
w n w								6.59	6.48	6.39	6.32
☉ ſet	6.00	6.10	6.19	6.29	6.39	6.49	7.00	7.11	7.22	7.31	7.39
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Ampl.	00.0	3.28	6.58	10.27	13.58	17.30	21.5	24.42	28.23	31.22	33.4

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.31	0.33	0.34	0.36	0.37	0.39	0.40	0.42	0.43	0.45	0.46
s s w	1.04	1.07	1.10	1.13	1.16	1.19	1.22	1.25	1.28	1.31	1.33
sw by s	1.40	1.44	1.48	1.53	1.57	2.02	2.06	2.11	2.16	2.20	2.23
s w	2.19	2.25	2.31	2.37	2.43	2.49	2.56	3.02	3.09	3.14	3.19
sw by w	3.04	3.12	3.19	3.27	3.35	3.42	3.51	3.59	4.08	4.15	4.20
w s w	3.57	4.06	4.15	4.24	4.33	4.42	4.52				
w by s	4.56	5.06	5.16	5.26							
Weſt	6.00										
☉ ſet	6.00	5.50	5.14	5.31	5.21	5.11	5.00	4.49	4.38	4.29	4.21

A Sun-Dial for the Latitude of 45 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.32	0.31	0.29	0.28	0.26	0.25	0.24	0.22	0.20	0.19	0.18
s s w	1.05	1.03	1.00	0.57	0.54	0.51	0.48	0.45	0.42	0.39	0.37
s w by s	1.41	1.37	1.33	1.28	1.24	1.19	1.15	1.10	1.05	1.01	0.58
s w	2.21	2.15	2.09	2.03	1.58	1.52	1.45	1.39	1.33	1.27	1.23
sw by w	3.06	2.59	2.52	2.45	2.37	2.29	2.22	2.13	2.05	1.58	1.53
w s w	3.59	3.50	3.41	3.32	3.23	3.14	3.05	2.55	2.45	2.37	2.30
w by s	4.57	4.47	4.38	4.28	4.18	4.08	3.57	3.46	3.35	3.26	3.18
Weſt	6.00	5.50	5.40	5.30	5.19	5.09	4.58	4.46	4.35	4.25	4.17
w by n					6.24	6.14	6.03	5.52	5.41	5.31	5.24
w n w								6.59	6.48	6.40	6.33
nw by w											7.40
⊙ ſet	6.00	6.10	6.20	6.30	6.41	6.51	7.02	7.13	7.25	7.35	7.43
Sun's	d m	d m	d m	d m	d	d m	d m	d m	d m	d m	d m
Ampl.	0.00	3.32	7.05	10.38	14.13	17.49	21.28	25.9	28.56	31.58	34.20

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.32	0.33	0.35	0.36	0.38	0.39	0.41	0.42	0.44	0.45	0.46
s s w	1.05	1.08	1.11	1.14	1.17	1.20	1.23	1.26	1.29	1.31	1.33
sw by s	1.41	1.45	1.50	1.54	1.58	2.03	2.07	2.12	2.17	2.21	2.24
s w	2.21	2.27	2.33	2.39	2.44	2.51	2.57	3.03	3.10	3.15	3.19
sw by w	3.06	3.14	3.21	3.28	3.36	3.44	3.51	4.00	4.08	4.15	
w s w	3.59	4.07	4.16	4.25	4.34	4.43	4.52				
w by s	4.57	5.07	5.17	5.26							
Weſt	6.00										
⊙ ſet	6.00	5.50	5.40	5.30	5.19	5.09	4.58	4.47	4.35	4.25	4.17

A Sun-Dial for the Latitude of 46 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.33	0.31	0.30	0.29	0.27	0.26	0.24	0.23	0.21	0.20	0.19
s s w	1.06	1.04	1.01	0.58	0.55	0.52	0.49	0.46	0.43	0.41	0.39
sw by s	1.43	1.38	1.34	1.30	1.26	1.21	1.17	1.12	1.08	1.04	1.01
s. w	2 23	2.17	2.11	2.06	2.00	1.54	1.48	1.42	1.36	1.30	1.26
sw by w	3.08	3.01	2.54	2.47	2.40	2.32	2.25	2.17	2.09	2.02	1.57
w s w	4.00	3.52	3.43	3.35	3.26	3.17	3.08	2.59	2.49	2.41	2 35
w by s	5.58	4.49	4.39	4.30	4.20	4.11	4.00	3.50	3.39	3.30	3.23
Weſt	6.00	5.50	5.40	5.30	5.20	5.11	5.00	4.49	4.38	4.28	4.21
w b n					6.24	6.14	6.04	5.54	5.43	5.33	5.26
w n w								6.59	6.49	6.41	6.34
nw by w											7.40
⊙ ſet	6.00	6.10	6.21	6.31	6.42	6.53	7.04	7.16	7.29	7.39	7.47
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Ampl.	0.00	3.36	7.12	10.50	14.28	18.9	21.52	25.39	29.31	32.37	35.3

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.33	0.34	0.35	0.37	0.38	0.40	0.41	0.42	0.44	0.45	0.46
s s w	1.06	1.09	1.12	1.15	1.18	1.20	1.23	1.26	1.29	1.32	1.34
sw by s	1.43	1.47	1.51	1.55	2.00	2.04	2.08	2.13	2.18	2.22	2.25
s w	2.23	2.29	2.34	2.40	2.46	2.52	2.58	3.04	3.10	3.16	3.20
sw by w	3.08	3.16	3.23	3 30	3.37	3.45	3.52	4.00	4.08	4.15	
w s w	4.00	4.09	4.17	4.26	4.34	4.43					
w by s	4.58	5.08	5.17	5.26							
Weſt	6.00										
⊙ ſet	6.00	5.50	5 39	5.29	5.18	5 07	4.56	4.44	4.31	4.21	4.13

A Sun-Dial for the Latitude of 47 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.33	0.32	0.30	0.29	0.28	0.26	0.25	0.23	0.22	0.21	0.20
s s w	1.07	1.05	1.02	0.59	0.56	0.54	0.51	0.48	0.45	0.42	0.40
s w by s	1.44	1.40	1.36	1.32	1.28	1.23	1.19	1.15	1.10	1.06	1.03
s w	2.25	2.19	2.14	2.08	2.02	1.57	1.51	1.45	1.39	1.33	1.29
sw by w	3.10	3.03	2.56	2.49	2.43	2.35	2.28	2 20	2.13	2.06	2.01
w s w	4.02	3.54	3.46	3.37	3.29	3.20	3.12	3.03	2.53	2.45	2.39
w by s	4.59	4.50	4.41	4.32	4.23	4.13	4.03	3.53	3.43	3.34	3.27
Weſt	6.00	5.51	5.41	5.32	5.22	5.12	5.02	4.52	4.41	4.31	4.24
w by n				6.34	6.25	6.15	6.05	5.55	5.44	5.36	5.29
w n w							7.08	6.59	6.49	6.41	6.35
nw by w											7.40
☉ ſet	6.00	6.11	6.22	6.33	6.43	6.55	7.07	7.20	7.32	7.43	7.51
Sun's Ampl.	d m 0.00	d m 3.40	d m 7.20	d m 11.2	d m 14.44	d m 18.30	d m 22.18	d m 26.10	d m 30.7	d m 33.18	d m 35.48

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.33	0.34	0.36	0.37	0.38	0.40	0.41	0.43	0.44	0.45	0.46
s s w	1.07	1.10	1.13	1.16	1.18	1.21	1.24	1.27	1.30	1.32	1.34
sw by s	1.44	1.48	1.52	1.57	2.01	2.05	2.09	2.14	2.18	2.22	2.25
s w	2.25	2.30	2.36	2.41	2.47	2.53	2.59	3.05	3.11	3.16	3.20
sw by w	3.10	3.17	3.24	3.31	3.38	3.45	3.53	4.00	4.08	4.15	
w s w	4.02	4.10	4.18	4.26	4.35	4.43					
w by s	4.59	5.08	5.17								
Weſt	6.00										
☉ ſet	6.00	5.49	5.38	5.27	5.17	5.05	4.53	4.40	4.28	4.13	4.09

A Sun-Dial for the Latitude of 48 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.34	0.32	0.31	0.30	0.28	0.27	0.26	0.24	0.23	0.22	0.21
s s w	1.08	1.06	1.03	1.00	0.58	0.55	0.52	0.49	0.46	0.44	0.42
sw by s	1.46	1.42	1.38	1.34	1.30	1.25	1.21	1.17	1.12	1.08	1.05
s w	2.27	2.21	2.16	2.10	2.05	1.59	1.53	1.47	1.41	1.36	1.32
sw by w	3.12	3.06	2.59	2.52	2.46	2.38	2.31	2.23	2.16	2.09	2.04
w s w	4.03	3.56	3.48	3.40	3.32	3.23	3.15	3.06	2.57	2.49	2.43
w by s	5.00	4.51	4.43	4.34	4.25	4.16	4.06	3.56	3.46	3.38	3.31
Weſt	6.00	5.51	5.42	5.33	5.23	5.14	5.04	4.54	4.43	4.35	4.28
w b n				6.34	6.25	6.16	6.06	5.56	5.46	5.38	5.31
w n w							7.08	6.59	6.50	6.42	6.36
nw by w										7.45	7.40
⊙ ſet	6.00	6.11	6.22	6.33	6.45	6.57	7.09	7.22	7.35	7.47	7.56
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Ampl.	0.00	3.44	7.29	11.15	15.2	18.52	22.45	26.43	30.45	34.3	36.35

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.34	0.35	0.36	0.38	0.39	0.40	0.42	0.43	0.45	0.46	0.47
s s w	1.08	1.11	1.14	1.16	1,19	1,22	1 25	1.28	1.31	1.33	1.35
sw by s	1.46	1.50	1.54	1.58	2.02	2.06	2,10	2.15	2.19	2.23	2.26
s w	2.27	2.32	2.37	2.43	2.48	2.54	3.00	3.05	3.12	3.17	3.21
sw by w	3.12	3.19	3.26	3.32	3.39	3.45	3.53	4.01	4.09		
w s w	4.03	4.11	4.19	4.27	4.35	4.44					
w by s	5.00	5.09	5.17	5.26							
Weſt	6.00										
⊙ ſet	6.00	5.49	5.38	5.27	5.15	5.03	4.51	4.38	4.25	4.13	4.04

A Sun-Dial for the Latitude of 49 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.34	0.33	0.32	0.30	0.29	0.28	0.26	0.25	0.23	0.22	0.21
s s w	1.09	1.07	1.04	1.02	0.59	0.56	0.53	0.51	0.48	0.45	0.43
sw by s	1.47	1.43	1.39	1.35	1.31	1.27	1.23	1.19	1.14	1.11	1.08
s w	2.28	2.23	2.18	2.12	2.07	2.01	1.56	1.50	1.44	1.39	1.35
sw by w	3.14	3.07	3.01	2.54	2.48	2.41	2.34	2.27	2.19	2.13	2.08
w s w	4.05	3.57	3.50	3.42	3.34	3.26	3.18	3.09	3.00	2.53	2.47
w by s	5.01	4.53	4.44	4.36	4.27	4.18	4.09	4.00	3.50	3.42	3.35
Weſt	6.00	5.51	5.42	5.34	5.25	5.16	5.06	4.56	4.46	4.38	4.31
w by n				6.34	6.25	6.16	6.07	5.58	5.48	5.40	5.33
w n w							7.08	7.00	6.51	6.43	6.38
nw by w										7.45	7.40
⊙ ſet	6.00	6.11	6.23	6.34	6.47	6.59	7.12	7.25	7.39	7.51	8.00
Sun's Ampl.	d m 0.00	d m 3.18	d m 7.38	d m 11.28	d m 15.21	d m 19.15	d m 23.14	d m 27.17	d m 31.25	d m 34.48	d m 37.26

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.34	0.35	0.37	0.38	0.39	0.41	0.42	0.43	0.45	0.46	0.47
s s w	1.09	1.12	1.15	1.17	1.20	1.23	1.25	1.28	1.31	1.33	1.35
sw by s	1.47	1.51	1.55	1.59	2.03	2.07	2.11	2.15	2.20	2.23	2.26
s w	2.28	2.33	2.39	2.44	2.49	2.55	3.00	3.06	3.12	3.17	3.21
sw by w	3.14	3.20	3.27	3.34	3.40	3.47	3.54	4.01	4.09		
w s w	4.05	4.13	4.20	4.28	4.36	4.44					
w by s	5.01	5.09	5.18								
Weſt	6.00										
⊙ ſet	6.00	5.49	5.37	5.26	5.13	5.01	4.48	4.35	4.21	4.09	4.00

A Sun-Dial for the Latitude of 50 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.35	0.33	0.32	0.31	0.30	0.28	0.27	0.26	0.24	0.23	0.22
s s w	1.10	1.08	1.05	1.03	1.00	0.58	0.55	0.52	0.49	0.47	0.45
sw by s	1.48	1.45	1.41	1.37	1.33	1.29	1.25	1.21	1.16	1.13	1.10
s w	2.30	2.25	2.20	2.15	2.09	2.04	1.58	1.53	1.47	1.42	1.38
sw by w	3.16	3.09	3.03	2.56	2.50	2.43	2.36	2.30	2.23	2.16	2.12
w s w	4.06	3.59	3.51	3.44	3.36	3.29	3.21	3.13	3.04	2.57	2.51
w by s	5.02	4.54	4.45	4.37	4.29	4.20	4.12	4.03	3.53	3.45	3.39
Weſt	6.00	5.52	5.43	5.34	5.26	5.17	5.08	4.59	4.49	4.41	4.34
w by n				6.34	6.25	6.17	6.08	5.59	5.49	5.42	5.36
w n w							7.08	7.00	6.51	6.44	6.39
nw by w										7.45	7.41
☉ ſet	6.00	6.12	6.24	6.36	6.49	7.01	7.14	7.28	7.43	7.55	8.05
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Ampl.	00.0	3.53	7.48	11.42	15.40	19.40	23.45	27.53	32.8	35.37	38.20

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.35	0.36	0.37	0.38	0.40	0.41	0.42	0.44	0.45	0.46	0.47
s s w	1.10	1.13	1.15	1.18	1.21	1.23	1.26	1.29	1.32	1.34	1.36
sw by s	1.48	1.52	1.56	2.00	2.04	2.08	2.12	2.16	2.20	2.24	2.27
s w	2.30	2.35	2.40	2.45	2.50	2.56	3.01	3.07	3.13	3.17	3.21
sw by w	3.16	3.22	3.28	3.35	3.41	3.48	3.55	4.02	4.09		
w s w	4.06	4.14	4.21	4.29	4.36	4.44					
w by s	5.02	5.10	5.18								
Weſt	6.00										
☉ ſet	6.00	5.48	5.36	5.24	5.11	4.59	4.46	4.32	4.17	4.05	3.55

A Sun-Dial for the Latitude of 51 Degrees.

NORTH DECLINATION.

Deg Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.35	0.34	0.33	0.31	0.30	0.29	0.28	0.26	0 25	0.24	0.23
s s w	1.11	1.09	1.06	1.04	1.01	9.59	0.56	0.53	0.51	0.48	0.47
sw by s	1 50	1.46	1.42	1.39	1.35	1.31	1.27	1.23	1.19	1.15	1.12
s w	2.31	2.26	2.21	2.16	2.11	2.06	2.01	1.55	1.50	1.45	1.41
sw by w	3.17	3.11	3.05	2.59	2.52	2.46	2.39	2.33	2.26	2.20	2.15
w s w	4.08	4.01	3.53	3.46	3.39	3.31	3.24	3.16	3.08	3.01	2.55
w by s	5.03	4.55	4.47	4.39	4.31	4.22	4.14	4.05	3.56	3.49	3.43
Weſt	6.00	5.52	5.44	5.35	5.27	5.18	5.10	5.01	4.52	4.44	4.37
w by n				6.34	6.26	6.17	6.09	6.00	5.51	5.44	5.38
w n w							7.08	7.00	6.52	6.45	6.40
nw by w										7.45	7.41
⊙ ſet	6.00	6.12	6.25	6.38	6.50	7.03	7.17	7.32	7.47	8.00	8.10
Sun's Ampl.	d m 0.00	d m 3.58	d m 7.58	d m 11.57	d m 16.1	d m 20.8	d m 24.18	d m 28.33	d m 32.54	d m 36.30	d m 39.19

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.35	0.36	0.38	0.39	0.40	0.41	0.42	0.44	0.46	0.47	0.48
s s w	1.11	1.14	1.16	1.19	1.21	1.24	1.27	1.29	1.32	1.34	1.36
sw by s	1.50	1.53	1.57	2.01	2.05	2.09	2.13	2.17	2.21	2.24	2.27
s w	2.31	2.36	2.41	2.46	2.52	2.57	3.02	3.07	3.13	3.18	3.21
sw by w	3.17	3.23	3.30	3.36	3.42	3.49	3.55	4.02	4.09		
w s w	4.08	4.15	4.22	4.29	4.37	4.44					
w by s	5.03	5.10	5.18								
Weſt	6.00										
⊙ ſet	6.00	5.48	5.35	5.22	5.10	4.57	4.43	4.28	4.13	4.00	3.50

A Sun-Dial for the Latitude of 52 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.36	0.34	0.33	0.32	0.31	0.30	0.28	0.27	0.26	0.25	0.24
s s w	1.12	1.10	1.08	1.05	1.03	1.00	0.57	0.55	0.52	0.50	0.48
sw by s	1 51	1.47	1.44	1.40	1.36	1.33	1.29	1.25	1.21	1.17	1.15
s w	2.33	2.28	2.23	2.18	2,13	2.08	2.03	1.58	1.52	1.48	1.44
sw by w	3.19	3.13	3.07	3.01	2.55	2.48	2.42	2.36	2.29	2.24	2.19
w s w	4.09	4.02	3.55	3.48	3.41	3.34	3.26	3.19	3.11	3.04	2.59
w by s	5.03	4.56	4.48	4.40	4.33	4.25	4.16	4.08	3.59	3.52	3.46
Weſt	6.00	5.52	5.44	5.36	5.28	5.20	5.12	5.03	4.54	4.46	4.40
w by n				6.34	6.26	6.18	6.10	6.01	5.53	5.45	5.40
w n w							7.08	7.00	6.53	6.46	6.41
nw byw										7.45	7.41
☉ ſet	6.00	6.13	6.26	6.39	6.52	7.06	7.20	7.35	7.51	8.05	8.16
Sun's Ampl.	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
	00.0	4.03	8.08	12.13	16.23	20.35	24.52	29 14	33.44	37.27	40,23

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.36	0,37	0.38	0.39	0.41	0.42	0.43	0.44	0.46	0.47	0.48
s s w	1.12	1.15	1.17	1.20	1.22	1.25	1.27	1.30	1.33	1.35	1.37
sw by s	1.51	1.55	1.58	2.02	2.06	2.10	2.13	2.17	2.22	2.25	2.28
s w	2.33	2.38	2.43	2.48	2.53	2.58	3.03	3.08	3.13	3.18	3.22
sw by w	3.19	3.25	3.31	3.37	3.43	3.49	3.56	4.02	4.10		
w s w	4.09	4.16	4.23	4.30	4.37	4.44					
w by s	5.03	5.11	5.19								
Weſt	6.00										
☉ ſet	6.00	5.47	5.34	5.21	5.08	4.54	4.40	4.25	4.09	3.55	3.44

A Sun-Dial for the Latitude of 53 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.36	0.35	0.34	0.33	0.31	0.30	0.29	0.28	0.26	0.25	0.24
s s w	1.13	1.11	1.08	1.06	1.04	1.01	0.59	0.56	0.53	0.51	0.50
sw by s	1.52	1.49	1.45	1.41	1.38	1.34	1.31	1.27	1.23	1.19	1.17
s w	2.34	2.30	2.25	2.20	2.15	2.10	2.05	2.00	1.55	1.51	1.47
sw by w	3.20	3.15	3.09	3.03	2.57	2.51	2.45	2.38	2.32	2.26	2.22
w s w	4.10	4.04	3.57	3.50	3 43	3.36	3.29	3.22	3.14	3.08	3.03
w by s	5.04	4.57	4.49	4.42	4.34	4.27	4.19	4.11	4 02	3.55	3.50
Weſt	6.00	5.52	5.45	5.37	5.29	5.22	5.13	5.05	4.56	4.49	4.43
w by n				6.34	6.26	6.19	6.11	6.03	5.54	5.47	5.42
w n w							7.08	7.01	6.53	6.47	6.42
nw byw									7.51	7.46	7.42
⊙ ſet	6.00	6.14	6.27	6.41	6.54	7.08	7.23	7.39	7.56	8.10	8.21
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Ampl.	0.00	4.09	8 19	12.31	16.46	21.5	25.28	29.59	34.39	38.29	41.29

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.36	0.37	0.38	0.40	0.41	0.42	0.43	0.45	0.46	0.47	0.48
s s w	1.13	1.16	1.18	1.20	1.23	1.25	1.28	1.30	1.33	1.35	1.37
sw by s	1.52	1.56	2.00	2.03	2.07	2.10	2.14	2.18	2.22	2.25	2.28
s w	2.34	2.39	2.44	2.49	2.54	2.58	3.03	3.09	3.14	3.18	3.22
sw by w	3.20	3.26	3.32	3.38	3.44	3.50	3.56	4.12			
w s w	4.10	4.17	4.24	4.30	4.37	4.44					
w by s	5.04	5.11	5.19								
Weſt	6.00										
⊙ ſet	6.00	5.46	5.33	5.19	5.06	4.52	4.37	4.21	4.04	3.50	3.39

A Sun-Dial for the Latitude of 54 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.37	0.35	0.34	0.33	0.32	0.31	0.29	0.28	0.27	0.26	0.25
s s w	1.14	1.12	1.09	1.07	1.05	1.02	1.00	0.57	0.55	0.53	0.51
s w by s	1.54	1.50	1.47	1.43	1.40	1.36	1.32	1.29	1.25	1.22	1.19
s w	2.36	2.31	2.27	2.22	2.17	2.12	2.08	2.03	1.57	1.53	1.50
sw byw	3.22	3.16	3.11	3.05	2.59	2.53	2.47	2.41	2.35	2.29	2.25
w s w	4.12	4.05	3.59	3.52	3.45	3.39	3.32	3.24	3.17	3.11	3.06
w by s	5.05	4.58	4.51	4.43	4.36	4.29	4.21	4.13	4.05	3.58	3.53
Weſt	6.00	5.53	5.45	5.38	5.31	5.23	5.15	5.07	4.59	4.52	4.46
w by n				6.34	6.27	6.19	6.12	6.04	5.56	5.49	5.44
w n w							7.09	7.01	6.54	6.48	6.43
nw byw									7.51	7.46	7.42
☉ ſet	6.00	6.14	6.28	6.42	6.56	7.11	7.27	7.43	8.00	8.15	8.27
Sun's Ampl.	d m 0.00	d m 4.15	d m 8.31	d m 12.49	d m 17.11	d m 21.36	d m 26.7	d m 30.46	d m 35.35	d m 39.26	d m 42.46

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.37	0.38	0.39	0.40	0.41	0.42	0.44	0.45	0.46	0.47	0.48
s s w	1.14	1.16	1.19	1.21	1.24	1.26	1.28	1.31	1.33	1.35	1.37
sw by s	1.54	1.57	2.01	2.04	2.08	2.11	2.15	2.19	2.23	2.26	2.28
s w	2.36	2.41	2.45	2.50	2.54	2.59	3.04	3.09	3.15	3.19	3.22
sw byw	3.22	3.27	3.33	3.39	3.44	3.50	3.56	4.03			
w s w	4.12	4.18	4.24	4.31	4.38	4.45					
w by s	5.05	5.12	5.19								
Weſt	6.00										
☉ ſet	6.00	5.46	5.32	5.18	5.04	4.49	4.33	4.17	4.00	3.45	3.33

A Sun-Dial for the Latitude of 55 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.37	0.36	0.35	0.34	0.33	0.31	0.30	0.29	0.28	0.27	0.26
s s w	1.15	1.13	1.10	1.08	1.06	1.03	1.01	0.59	0.56	0.54	0.52
sw by s	1.55	1.51	1.48	1.45	1.41	1.38	1.34	1.30	1.27	1.23	1.21
s w	2.37	2.33	2.28	2.24	2.19	2.14	2.10	2.05	2.00	1.55	1.52
sw by w	3.23	3.18	3.12	3.07	3.01	2.56	2.50	2.44	2.38	2.33	2.29
w s w	4.13	4.06	4.00	3.54	3 47	3.41	3.34	3.27	3.20	3.14	3.10
w by s	5.05	4.59	4.52	4.45	4.38	4.31	4.23	4.16	4 08	4.02	3.56
Weſt	6.00	5.53	5.46	5.39	5.32	5.24	5.17	5.09	5.01	4.54	4.49
w by n				6.34	6.27	6.20	6.13	6.05	5.57	5.51	5.46
w n w							7.09	7.02	6.55	6.49	6.44
nw by w									7.51	7.46	7.42
⊙ ſet	6.00	6.14	6.29	6.43	6.58	7.14	7.30	7.47	8.05	8.21	8.33
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Ampl.	0.00	4.21	8.44	13.9	17.37	22.10	26.49	31.37	36.36	40.47	44.00

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.37	0.38	0.39	0.40	0.42	0.43	0.44	0.45	0.46	0.47	0.48
s s w	1.15	1.17	1.20	1.22	1.24	1.26	1.29	1.31	1.34	1.36	1.38
sw by s	1.55	1.58	2.01	2.05	2.08	2.12	2.16	2.19	2.23	2.26	2.29
s w	2.37	2.42	2.46	2.51	2.55	3.00	3.05	3.10	3.15	3.19	3.22
sw by w	3.23	3.29	3.34	3.40	3.45	3.51	3.57	4.03			
w s w	4 13	4.19	4.25	4.32	4.38	4.45					
w by s	5.05	5.12	5.19								
Weſt	6.00										
⊙ ſet	6.00	5.46	5.31	5.17	5.02	4.46	4.30	4.13	3.55	3.39	3.30

A Sun-Dial for the Latitude of 56 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.37	0.36	0.35	0.34	0.33	0.32	0.31	0.30	0.28	0.27	0.26
s s w	1.16	1.14	1.11	1.09	1.07	1.05	1.02	1.00	0.57	0.55	0.53
s w by s	1.56	1.53	1.49	1.46	1.43	1.39	1.36	1.32	1.28	1.26	1.23
s w	2.39	2.34	2.30	2.26	2.21	2.16	2.12	2.07	2.02	1.59	1.55
sw byw	3.25	3.19	3.14	3.09	3.03	2.58	2.52	2.46	2.40	2.36	2.32
w s w	4.14	4.08	4.02	3.56	3.50	3.43	3.37	3.30	3.23	3.17	3.13
w by s	5.06	5.00	4.53	4.46	4.40	4.33	4.26	4.18	4.11	4.05	4.00
Weſt	6.00	5.53	5.46	5.39	5.32	5.26	5.18	5.11	5.03	4.57	4.52
w by n				6.34	6.28	6.21	6.14	6.06	5.59	5.53	5.48
w n w						7.15	7.09	7.02	6.55	6.50	6.45
nw byw									7.51	7.46	7.43
⊙ ſet	6.00	6.15	6.30	6.45	7.00	7.16	7.34	7.52	8.10	8.27	8.41
Sun's Ampl.	d m 0.00	d m 4.28	d m 8.57	d m 13.29	d m 18.5	d m 22.46	d m 27.34	d m 32.32	d m 37.42	d m 42.4	d m 45.27

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.37	0.39	0.40	0.41	0.42	0.43	0.44	0.45	0.47	0.48	0.48
s s w	1.16	1.18	1.20	1.22	1.25	1.27	1.29	1.32	1.34	1.36	1.38
sw by s	1.56	1.59	2.02	2.06	2.09	2.13	2.16	2.20	2.24	2.26	2.29
s w	2.39	2.43	2.47	2.52	2.56	3.01	3.06	3.10	3.15	3.19	
sw byw	3.25	3.30	3.35	3.40	3.46	3.51	3.57	4.03			
w s w	4.14	4.20	4.26	4.32	4.38						
w by s	5.06	5.13	5.19								
Weſt	6.00										
⊙ ſet	6.00	5.45	5.30	5.15	5.00	4.44	4.26	4.08	3.50	3.33	3.19

A Sun-Dial for the Latitude of 57 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.38	0.37	0.36	0.35	0.34	0.32	0.31	0.30	0.29	0.28	0.27
s s w	1.17	1.14	1.12	1.10	1.08	1.06	1.04	1.01	0.59	0.57	0.55
s w by s	1.57	1.54	1.51	1.47	1.44	1.41	1.37	1.34	1.30	1.27	1.25
s w	2.40	2.36	2.32	2.27	2.23	2.18	2.14	2.10	2.05	2.01	1 58
sw byw	3.26	3.21	3.16	3.11	3.05	3.00	2.55	2.49	2.43	2.38	2.34
w s w	4.15	4.09	4.03	3.57	3.51	3.45	3.39	3.33	3.26	3.20	3.16
w by s	5.07	5.01	4.54	4.47	4.41	4.34	4.28	4.21	4.13	4.07	4.03
Weſt	6.00	5.53	5.47	5.40	5.33	5.27	5.20	5.12	5.05	4.59	4.54
w by n				6.34	6.28	6.21	6.14	6.07	6.00	5.54	5.50
w n w						7.15	7.09	7.03	6.56	6.51	6.46
nw byw									7.52	7.47	7.43
n w											8.38
☉ ſet	6.00	6.16	6.31	6.47	7.03	7.20	7.38	7.56	8.16	8.34	8.48
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Ampl.	0.00	4.35	9.11	13.52	18.33	23.24	28.22	33.31	38.53	43.27	47.2

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
by w	0.38	0.39	0.40	0.41	0.42	0.43	0.44	0.46	0.47	0.48	0.49
s w	1.17	1.19	1.21	1.23	1.25	1.27	1.30	1.32	1.34	1.36	1.38
by s	1.57	2.00	2.03	2.07	2.10	2.13	2.17	2.20	2.24	2.27	2.29
s w	2.40	2.44	2.48	2.53	2.57	3.02	3.06	3.10	3.15	3.19	
byw	3.26	3.31	3.36	3.41	3.46	3.51	3.57	4.03			
s w	4.15	4.21	4.26	4.32	4.38						
by s	5.07	5.13	5.19								
Weſt	6.00										
☉ ſet	6.00	5.44	5.29	5.13	4.57	4.40	4.22	4.04	3.44	3.26	3.12

A Sun-Dial for the Latitude of 58 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.38	0.37	0.36	0.35	0.34	0.33	0.32	0.31	0.30	0.29	0.28
s s w	1.17	1.15	1.13	1.11	1.09	1.07	1.05	1.02	1.00	0.58	0.57
sw by s	1.58	1.55	1.52	1.49	1.46	1.42	1.39	1.36	1.32	1.29	1.27
s w	2.41	2.37	2.33	2.29	2.25	2.20	2.16	2.12	2.07	2.04	2.01
sw byw	3.27	3.22	3.17	3.12	3.07	3.02	2.57	2.51	2.46	2.41	2.38
w s w	4.16	4.10	4.05	3.59	3.53	3.47	3.41	3.35	3.29	3.23	3.19
w by s	5.07	5.01	4.55	4.49	4.43	4.36	4.30	4.23	4.16	4.10	4.06
Weſt	6.00	5.54	5.47	5.41	5.34	5.28	5.21	5.14	5.08	4.02	4.57
w by n				6.34	6.28	6.22	6.15	6.08	6.02	5.56	5.51
w n w						7.16	7.10	7.03	6.57	6.52	6.48
nw byw								7.57	7.52	7.47	7.44
n w											8.38
⊙ ſet	6.00	6.16	6.32	6.49	7.06	7.24	7.42	8.01	8.22	8.41	8.56
Sun's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
Ampl.	0.00	4.43	9.26	14.16	19.7	24.6	29 14	44.34	40.12	44.59	48.4

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	21	12	12	12	12	12
s by w	0.38	0.39	0.40	0.41	0.43	0.44	0.45	0.46	0.47	0.48	0.49
s s w	1.17	1.19	1.22	1.24	1.26	1.28	1.30	1.32	1.35	1.37	1.38
sw by s	1.58	2.01	2.04	2.07	2.10	2.14	2.17	2.21	2.24	2.27	2.29
s w	2.41	2.45	2.49	2.53	2.57	3.02	3.06	3.10	3.15	3.19	
sw by w	3.27	3.32	3.37	3.42	3.47	3.52	3.57				
w s w	4.16	4.21	4.27	4.33	4.38						
w by s	5.07	5.13	5.19								
Weſt	6.00										
⊙ ſet	6.00	5.44	5.28	5.11	4.54	4.36	4.18	3.59	3.38	3.19	3.0

A Sun-Dial ſor the Latitude of 59 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
oint	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
outh	12	12	12	12	12	12	12	12	12	12	12
by w	0.39	0.38	0.37	0.36	0 35	0.34	0.32	0.31	0.30	0.29	0.29
s w	1.18	1.16	1.14	1.12	1.10	1.08	1.06	1.04	1.01	1.00	0.58
by s	1.59	1.56	1.53	1.50	1,47	1.44	1.41	1.38	1.34	1.31	1.29
s w	2.42	2.38	2.35	2.31	2.27	2.23	2.19	2.14	2.10	2.06	2.03
by w	3.28	3.24	3.19	3.14	3.09	3.04	2.59	2.54	2.49	2.44	2.41
s w	4.17	4.12	4.06	4.01	3.55	3.49	3.43	3.38	3.32	3.26	3.22
by s	5.08	5.02	4.56	4.50	4.44	4.38	4.32	4.25	4.19	4.13	4.09
Weſt	6.00	5.54	5.48	5.42	5.35	5.29	5.23	5.16	5.09	5.04	4.59
by n				6.35	6.29	6.22	6.16	6.10	6.03	5.58	5.53
n w						7.16	7.10	7.04	6.58	6.53	6.49
byw								7.57	7.52	7.48	7.44
n w										8.42	8.38
ſet	6.00	6.16	6.33	6.50	7.08	7.27	7.46	8.07	8.29	8.49	9.05
un's	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m	d m
mpl.	0.00	4.51	9.43	14.41	19.41	24.51	30.12	35.43	41.37	46.40	50.42

SOUTH DECLINATION.

eg. in.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
oint	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
uth	12	12	12	12	12	12	12	12	12	12	12
by w	0.39	0.40	0.41	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.49
s w	1.18	1.20	1.22	1.24	1.26	1.28	1.31	1.33	1.35	1.37	1.38
by s	1.59	2.02	2.05	2.08	2.11	2.14	2.18	2.21	2.24	2.27	2.29
w	2.42	2.46	2.50	2.54	2.58	3.02	3.06	3.11	3.15		
by w	3.28	3.33	3.38	3.43	3.47	3.52	3.57				
s w	4.17	4.22	4.28	4.33	4.39						
by s	5.08	5.14	5.19								
eſt	6.00										
ſet	6.00	5.44	5.27	5.10	4.52	4.33	4.14	3.53	3.31	3.11	2.55

A Sun-Dial for the Latitude of 60 Degrees.

NORTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	12	12	12	12	12	12
s by w	0.39	0.38	0.37	0.36	0.35	0.34	0.33	0.32	0.31	0.30	0.29
s s w	1.19	1.17	1.15	1.13	1.11	1.09	1.07	1.05	1.03	1.01	1.00
sw by s	2.00	1.57	1.54	1.51	1.48	1.45	1.42	1.39	1.36	1.33	1.31
s w	2.44	2.40	2.36	2.32	2.28	2.24	2.20	2.16	2.12	2.08	2.06
sw byw	3.29	3.25	3.20	3.16	3.11	3.06	3.01	2.56	2.51	2.47	2.44
w s w	4.18	4.13	4.07	4.02	3.57	3.51	3.46	3.40	3.34	3 29	3.25
w by s	5.08	5.03	4.57	4.51	4.45	4.40	4.34	4.27	4.21	4.16	4.12
Weſt	6.00	5.54	5.48	5.42	5.36	5.31	5.24	5.18	5.11	5.06	5.02
w by n				6.35	6.29	6.23	6.17	6.11	6.04	5.59	5.55
w n w						7.16	7.10	7.04	6.59	6.54	6.50
nw byw								7.57	7.52	7.48	7.45
n w										8.41	8.39
⊙ ſet	6.00	6.17	6.35	6.52	7.11	7.30	7.51	8.13	8.36	8.58	9.16
Sun's Ampl.	d m 0.00	d m 5.00	d m 10.2	d m 15.8	d m 20.18	d m 25 39	d m 31.09	d m 36.58	d m 42.10	d m 48.32	d m 52 51

SOUTH DECLINATION.

Deg. Min.	0 d	2 d 30m	5 d	7 d 30m	10 d	12 d 30m	15 d	17 d 30m	20 d	22 d	23 d 29m
Point	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m	h m
South	12	12	12	12	12	21	12	12	12	12	12
s by w	0.39	0.40	0.41	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.49
s s w	1.19	1.21	1.23	1.25	1.27	1.29	1.31	1.33	1.35	1.37	1.38
sw by s	2.00	2.03	2.06	2.09	2.12	2.15	2.18	2.21	2.24	2.27	2.29
s w	2.44	2.47	2.51	2.55	2.59	3.03	3.07	3.11	3.15		
sw by w	3.29	3.34	3.39	3.43	3.48	3.53	3.58				
w s w	4.18	4.23	4.28	4.33	4.39						
w by s	5.08	5.14	5.20								
Weſt	6.00										
⊙ ſet	6.00	5.43	5.25	5.08	4.49	4.30	4.09	3.47	3.24	3.02	2.44

The Deſcription and Uſe of the foregoing Sun Dial TABLES.

THESE Tables are intitled at the Head of each Page thus; *A Sun-Dial for the Latitude of* 0 *Degrees*; the next is, *A Sun-Dial for the Latitude of* 1 *Degree*, and ſo on orderly unto 60 Degrees, making in all 61 Dials; from Page 24 to Page 84.

Each Dial hath two Tables (the uppermoſt for North Declination, the lowermoſt for South Declination) and 12 Columns in each Table: At the Head of each Column, and right againſt Deg. Min. are the Degrees of Declination; thus | 0d. | 2d. 30m. | 5d. | 7d. 30m. | 10d. | 12d. 30m. | 15d. | 17d. 30m. | 20d. | 22d. | 23d. 29m. |; d. ſtanding for Degree, and m. for Minute.

Under thoſe Degrees and Minutes of Declination in each Column is ſet | h. m. |; h, ſtands for Hour, and m. for Minutes of an Hour.

In the Left-hand Column of each Table under Points (at the Head) are the Points of the Compaſs, thus, South, S. by W. SSW. SW. by S. SW. *&c.* S. by W. ſtanding for South and by Weſt; SSW. for South South Weſt; SW. by S. for South Weſt by South, and ſo for the reſt.

At the Foot of each Table, is the Sun's Setting and Sun's Amplitude, agreeable to thoſe ſeveral Declinations at the Head of each Column; and are diſtinguiſhed from the reſt by the Words in the Left-hand Column, thus, ☉ ſet, Sun's Amplitude, or ſo much of them as the Column can contain. *Note*, the Sun's ſetting is annexed to each Table, but the Sun's Amplitude only to that for North Declination, becauſe it's the ſame (for Quantity) for South Declination.

The Sun's ſetting is Hours and Minutes, but the Amplitude is Degrees and Minutes, having (d) over the Degrees, and (m) over the Minutes.

By theſe Tables (being Sun-Dials for all Latitudes) may be known the Time of the Day, the Sun being viſible in any Part of the Hemiſphere, as true and exact as though he was upon the Meridian; alſo his Riſing, Setting and Amplitude. The like may be known by any Star, whoſe Declination doth not exceed 23d. 29m. as will be evident by the following Propoſitions.

Propoſition 1. THE Latitude of a Place, the Sun's Declination, and his Bearing given; to find the Hour of the Day.

Note, By Bearing, is meant the Azimuth, or Point of the Compaſs he is upon; and that is found by Setting the Sun with an Azimuth Compaſs, which is the trueſt way, proper Allowance being made for the Variation, and is to be preferred before ſetting the Sun with a common Compaſs.

The Reſolution of this Paopoſitiou is thus;

1. Seek in the *Sun-Dial Table* for the given Latitude.

2. At the Head of the Table ſeek the given Declination or the neareſt to it.

3. Find the given Bearing among the Points of the Compaſs in the Left-hand Column.

4. Then look ſtrait to the Right-hand of the Bearing till you come right under the Declination, (before found) in the Head of the Table, and what Number you find there, is the Hour required.

Example 1. In the Latitude of 30 degrees, the Sun having 15 Degrees North Declination, I deſire to know at what a Clock the Sun cometh upon the SW. Point of the Compaſs?

Look for the Table that belongeth to the Latitude of 30 Degrees, in the Head of the Table, which is in Page 54, and look for 15d. in the Column under North Declination, and for SW. on the Left-hand of the Table, and then in the common Angle of Meeting you'll find the Hour of the Day to be 0h. 58m. that is 58m. paſt 12 a Clock, the Time required.

Example 2. I deſire to know what a Clock the Sun cometh to the SW. in the Latitude of 30 degrees, the Sun having 15 degrees South Declination? *Anſwer*, 34 minutes paſt 2 a Clock.

For if you turn to the Dial for Latitude 30 degrees in Page 54, and in the Table for South Declination, ſeek 15d. at the Head of it, under which, and right againſt SW. (on the Left-hand) you'll find 2h. 34m. the Time of the Day required.

If the Declination be not the ſame with the Declination in the Head of the Table; then look under that Declination neareſt to the Declination propoſed.

But more exactly thus, *Find the Hour for the next Declination both leſs and greater than the Declination propoſed*, and take the Difference of thoſe Hours, as alſo of the Declination belonging to them: Then ſay,

As the laſt Difference, is to the firſt Difference; ſo is the Difference between the Declination propoſed and the next leſs in the Table, to a fourth Proportional, which add to (*when the Hour in the Table increaſeth*) or (*when it decreaſeth*) ſubtract from the Hour belonging to the leſs Declination aforeſaid: So you'll have the Hour required exact to the Declination propoſed.

Example 3. Admit the Declination to be 18 deg. 20 min. North, I deſire to know at what a Clock the Sun cometh upon the WSW. Point of the Compaſs, in the Latitude of 30 degrees?

In the Table, the neareſt Number to 18 deg. 20 min. is 17d. 30m. Then under 17d. 30m. and againſt WSW. is 1h. 42m. which ſheweth that the Sun cometh upon the WSW. Point of the Compaſs, at 42m. paſt one a Clock.

Now becauſe the Declination propoſed, and the Declination in the Head of the Table, are ſomewhat different; therefore you may make a Proportion very eaſily thus, under 17d. 30m. and againſt WSW. you'll find 1

1h. 42m. and under 20d. 00m. you'll find 1h. 25m. the difference between theſe two Numbers is 17m. And the difference between the Declination 17d. 30m. and 20d. is 2d. 30m. or 150m. Alſo the difference between the Declination 18d. 20m. and 17d. 30m. is 50m. Then ſay, As 150m. is to 17m. ſo is 50m. to 6m. almoſt: But becauſe 50 is $\frac{1}{3}$ of 150, therefore the third-part of 17m. is near 6m. which ſubtracted from 1h. 42m. (becauſe the Hour decreaſeth) and the Remainder 1h. 36m. is the true Hour of the Day, the Sun being upon the W.S.W. Point of the Compaſs, having 18 Degrees 20 min. North Declination.

Do the like with any other Degrees and Minntes of Declination: But if the Declination be not very different from that in the Head of the Table, you need not make any Proportion: Likewiſe when the Sun is near the Meridian, you need not make any Proportion, becauſe there the difference is but ſmall.

Note, There are none but the *Afternoon Points* in the Tables of theſe *Dials*, yet you may eaſily find the Time of the Day for the *Forenoon Points* by what follows.

For Points equally diſtant from the Meridian, are equal Time from Noon, ſo that at what ſpace of Time from Noon the Sun is S.E. in the Forenoon, the like ſpace of Time from Noon he is S.W. Afternoon.

As in the Table following, the Points that ſtand right againſt one another, are equally diſtant from the Meridian; therefore to find the Hour of the Day, the Sun being upon any of the Forenoon Points, ſee what Time of the Day it is when the Sun is upon the Afternoon Points that ſtand right againſt the Forenoon Points deſired, and ſubtract thoſe Hours and Minutes from 12 Hours, the Remainder is the Hour and Minute of the Day required.

A TABLE *of the Points of the Compaſs, equally diſtant from the Meridian.*

Forenoon Points.	Afternoon Points.
South.	South.
South by Eaſt	South by Weſt
South South Eaſt	South South Weſt
South Eaſt by South	South Weſt by South
South Eaſt	South Weſt
South Eaſt by Eaſt	South Weſt by Weſt
Eaſt South Eaſt	Weſt South Weſt
Eaſt by South	Weſt by South
Eaſt.	Weſt.
Eaſt by North	Weſt by North
Eaſt North Eaſt	Weſt North Weſt
North Eaſt by Eaſt	North Weſt by Weſt
North Eaſt	North Weſt
North Eaſt by North	North Weſt by North
North North Eaſt	North North Weſt
North by Eaſt	North by Weſt
North.	North.
Forenoon Points.	Afternoon Points.

Example 4. In the Latitude of 60 degrees, the Sun ing North Eaſt; I demand the Hour of the Day, the having 22 Degrees North Declination.

In the *Sun-Dial* for Latitude 60 Degrees, (in Page 84) k againſt NW. which is the *Afternoon Point*, corre-nding to N.E. the *Forenoon Point*,) and finding the De-nation 22 Degrees in the Head of the Table, in the com-n Angle of Meeting is 8 Hours 41 Minutes, which tract from 12 Hours, the Remainder 3 Hours 19 nutes, is the Hour of the Day required in the Morning.

Examp.

Example 5. The Sun being ENE. in the ſame Latitude, with the ſame Declination; I demand the Hour of the Day?

In Latitude 60 degrees, and North Declination 22 degrees, the Sun being WNW. it is 54 Minutes paſt 6 a Clock in the Afternoon; which ſubtract from 12 Hours, the Remainder is 6 minutes paſt 5 in the Morning; the Time deſired.

Example 6. In the Latitude 35 degrees North, the Sun having 15 degrees North Declination, and being South Eaſt by Eaſt; I demand the Hour and Minute of the Day?

In the Table for Latitude 35 degrees (in Page 59) look againſt SW. by W. (the Afternoon Point) correſpondent to SE. by E. the Forenoon Point). And the Declination 15d. in the Head of the Table, and in the common Angle of Meeting is 1h. 45m. which deducted from 12 Hours, the Remainder is 15 minutes paſt 10 Clock, the true Time of the Day deſired.

Example 7. In the Latitude 35 degrees North, the Sun having 15 degrees South Declination, and being SE by E. I demand the Hour of the Day?

Anſw. 20 Minutes paſt 8 a Clock; for the Hour in the Table is 3 Hours 40 Minutes, which ſubtracte from 12 Hours, leaveth 8 Hours 20 Minutes, the Hou required.

The like is to be underſtood of any other Latitude, wit any other Declination, and with any other Point of th Compaſs.

Note; Theſe Tables ſerve as well in *South Latitude*, in *North Latitude*, only the Difference will be this;

If the Latitude be contrary, then the Declination mu be contrary, and the Points of the Compaſs contrary; th is to ſay, North Declination muſt be counted South; an South Declination muſt be counted North; and the Sout

Poi

Point muſt be North ; and S. by W. muſt be N. by W. and SSW. muſt be NNW. and SW. by S. muſt be NW. by N. and ſo for any other Point, as in the following Table.

A TABLE of Points equal diſtant from Noon, both in North Latitude, and in South Latitude; either before Noon or Afternoon.

North Latitude.		South Latitude.	
Forenoon.	Afternoon.	Forenoon.	Afternoon.
S by E.	S by W.	N by E.	N by W.
S S E.	S S W.	N N E.	N N W.
S E by S.	S W by S.	N E by N.	N W by N.
South Eaſt.	South Weſt.	North Eaſt.	North Weſt.
S E by E.	S W. by W.	N E by E.	N W by W.
E S E.	W S W.	E N E.	W N W.
E. by S.	W by S.	E by N.	W by N.
Eaſt.	Weſt.	Eaſt.	Weſt.
E by N.	W by N.	E by S.	W by S.
E N E.	W N W.	E S E.	W S W.
N E by E.	N W by W.	S E by E.	S W by W.
North Eaſt.	North Weſt.	South Eaſt.	South Weſt.
N E by N.	N W by N.	S E by S.	S W by S.
N N E.	N N W.	S S E.	S S W.
N by E.	N by W.	S by E.	S by W.
North.	North.	South.	South.

ropoſition 2. *To find the Hour of the Night by the Stars, and the Tables of Sun-Dials.*

YOU may find the Hour of the Night by the Bearing of any known Star, whoſe Declination doth not ex- ed the Sun's greateſt Declination, after this manner.

Find the Time of the *Star's* coming to the Meridian on the Day propoſed; then if the Star be on the Eaſt-ſide of the Meridian, ſubtract the Hours and Minutes which theſe Tables ſhews, from the Time of the Star's coming to the Meridian, the Remainder is the Hour of the Night: But if the Star be on the Weſt-ſide of the Meridian, then add thoſe Hours and Minutes aboveſaid, to the Time of the Star's coming to the Meridian, the Sum is the Hour of the Night.

To find what Time the Star's come upon, or to the Meridian, ſee the *Mariner's Calendar*, in the Uſes of the Tables of the Sun's, and a Star's Right Aſcenſion, Pages 57, 58, 59, 60 and 61.

Example 8. Admit the 26th Day of *October*, in the Latitude 40 degrees North, I obſerve the *Bull's Eye* to be SE. I demand the Hour of the Night.

The 26th Day of *October*, the *Bull's Eye* cometh on the Meridian at 19 Minutes paſt 2 a Clock in the Morning; this Star's Declination is 15 deg. 59 min. North, therefore in the Table that belongs to 40 Degrees in Page 64, I ſeek in the Head of the Table the Declination of the Star, or neareſt thereto, and by the Side, the Point of the Compaſs, and in the common Angle of Meeting, is 1h. 31m. which ſubtracted from 2 hours 19 min. the Star's Southing, the Remainder 0 hour 48 min. is the Hour of the Night deſired. But if this Star had born SW. you muſt have added, and then the Hour would have been 50 min. paſt 3 a Clock in the Morning.

The Operation.

	h.	m.
The Time of the Star's, being on the Meridian —	2	19
His Diſtance from the Meridian either at SE. or SW.	1	31
The Time of the Night, the Star being SE. —	0	48
The Time of the Night, the Star being SW. —	3	5

Exampl

Example 9. Admit the 16th Day of *November*, in Latitude 45 Degrees North; I ſee the *Lion's Tail* upon the E.S.E. Point of the Compaſs, having Declination 15d. 55m. North, I demand the Hour of the Night.

The Operation.	h.		m.	
Time of the Star's being on the Meridian—	08	:	09	Morn.
His Diſtance from the Meridian being——	03	:	01	
Time of the Night, the Star is E.S.E. —	05	:	08	Morn.
Time when this Star is W.S.W. ———	11	:	10	Morn.

Note; If the Compaſs hath Variation, you muſt allow for the Variation; but if you will uſe this following Inſtrument, which I call the Rectifier, you need not reckon which way the Variation is, either Eaſtward or Weſtward; for this Inſtrument will do it ſo plain, that you cannot be miſtaken, as is ſhewn in the following part of this Book: But for the preſent I will only give you one *Propoſition*, and apply it upon the Rectifier, which is as followeth;

Propoſition. Admit in Latitude 47 degrees North, the Sun being in one of the Equinoctal Points, at which Time he hath no Declination, I obſerve the Sun to riſe upon the E.S.E. Point of the Compaſs, I demand the Variation?

The Sun having no Declination, in any Latitude (if there being no Variation) the Sun will riſe at Eaſt, and ſet at Weſt; but according to the foregoing *Propoſition*, the Sun did riſe E.S.E. therefore there is two Points Variation, as will appear by the following Rectifier.

The Deſcription of the RECTIFIER.

THIS Inſtrument containeth two Circles or Compaſſes one within the other; but as it is made of Wood, e one moveth upon the other; ſo that the inward or upper Circle repreſenteth the Compaſs that you ſteer by, which is ſubject to Variation: But the outward or under Circle, repreſenteth a true Compaſs that never varieth. And by it you may readily rectify your Compaſs when it doth vary, thus;

Always bring the true Point of Riſing, or Setting on the outward or under Compaſs to touch the falſe Point of Riſing or Setting, on the inward or upper Compaſs, there let the Inſtrument ſtand.

As in the foregoing *Propoſition*: The Eaſt Point is the true Point of Riſing, and ESE. Point is the falſe Point of Riſing, therefore bring the Eaſt Point on the outward or under Compaſs, to touch the ESE. Point on the inward or upper Compaſs.

Then the Points that are on the outward or true Compaſs, ſhew the Points that are upon the inward or ſteering Compaſs; ſo that according to this Obſervation the N.N.E. Point on your Compaſs, is the true North Point; and the North is the true N.N.W. and the N.W. is the true W.N.W. and the Weſt is the true W.S.W. Point; as plainly appears by the Rectifier.

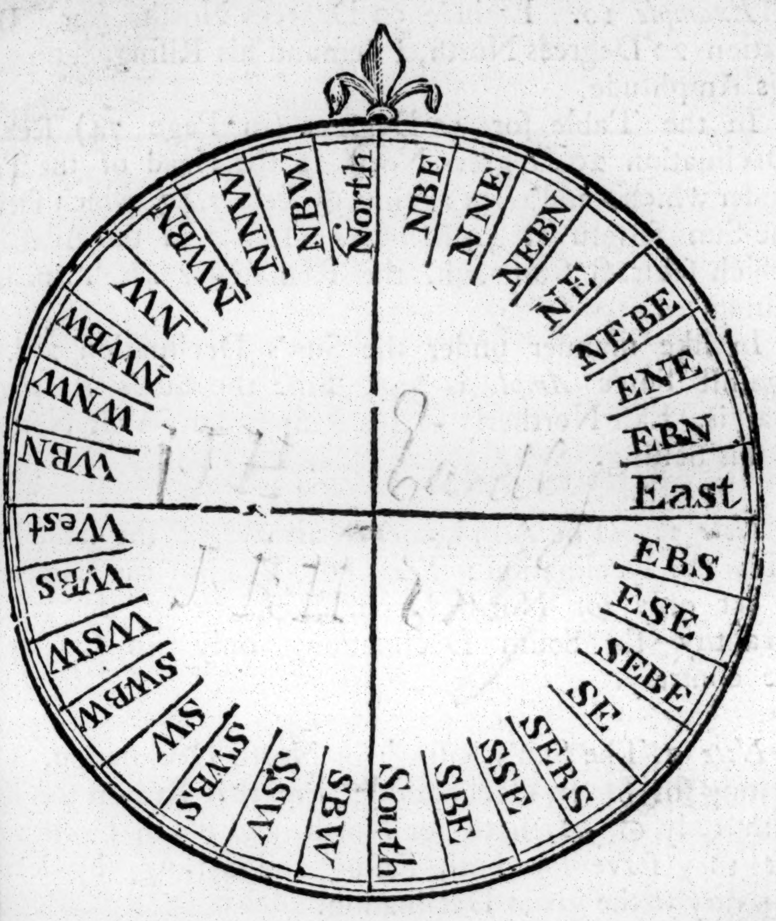
Note, The true Points are alway counted on the outward Circle or Compaſs.

This Inſtrument in Wood, is larger than this Figure, and there the Points are divided into Halves and Quarters; as alſo each Compaſs (in ſome) is divided into 360 Degrees, number'd from the North and South, (both ways) towards the Eaſt and Weſt, ending there in 90 Degrees.

A right Knowledge of the Quantity and Quality of the *Variation* of the Compaſs in different Latitudes and Longitudes, is of the utmoſt Importance, not only in the preceding Propoſition, but in all others where *Bearings* are required, and eſpecially in correcting the Courſes ſteered by a Ship at Sea; for which Purpoſe an accurate Variation Chart is lately conſtructed from more than Fifty Thouſand actual Obſervations, by *William Mountaine*, F.R.S. and Sold by Meſſ. *Mount* and *Page*, on *Tower-Hill.*

The

The RECTIFIER.



opoſition 3. *To find the Sun's Riſing, Setting, or Amplitude by the Table of the Sun Dial.*

N the Table for the Latitude of the Place, ſeek the Declination, under which, and againſt ⊙ *ſet*, is the n's Setting; and againſt *Sun's Ampl.* is the Amplitude.

Any

And if you ſubtract the Sun's Setting from 12 Hours gives its Riſing.

Example 10. Latiude 50 Degrees North, Sun's Declination 20 Degrees North, I demand his Riſing, Setting, an his Amplitude.

In the Table for 50 Degrees (in Page 74) ſeek th Declination 20 Degrees North at the Head of the Tabl under which, and right againſt ☉ *ſet* is 7.43, which ſhewet the Sun ſetteth at 43 Minutes after 7 in the Afternoon which ſubtract from 12h. the Remainder 4h. 17m. is hi Riſing.

In like manner under the Sun's Declination 20d. an againſt Sun's *Ampl.* is 32d. 8m. the Sun's Amplitude that is, Eaſt Northerly at his Riſing, but Weſt Northerl at his Setting.

Note 1. The Amplitude is always of the ſame Nam with the Declination: For that Reaſon the Amplitud is ſet only for North Declination, being the ſame Quantity for South Declination, only in Quality i the contrary.

Note 2 The Sun's Riſing for North Declination, is th Setting for South Declination: For that Reaſon the Tab hath only ☉ *ſet*, both for North and South Declinatio yet they ſerve for both Riſing and Setting, by lookin contrary to the given Declination.

Wherefore, to find the Sun's Riſing, when he hat North Declination, look under South Declination; an when he hath South Declination (to find his Riſing) loo under North Declination.

Note 3. In South Latitude with South Declinatio alſo in South Latitude with North Declination, the Sun Riſing and Setting is the ſame as in North Latitude wi North Declination, as alſo in North Latitude with Sou Declination, Therefore thoſe Tables are as uſeful in South Latitude as in North Latitude; if North Declination in theſe Tables be counted for South, and South for North.

Note 4. The Riſing, Setting, and Amplitude of any Star (whoſe Declination doth not exceed the Sun's greateſt Declination) may be found by theſe Tables; provided it's Southing, or Time of the Star's coming to or on the Meridian, be known.

For the Time of Sun-ſetting in theſe Tables for any Latitude, is a Star's half Continuance above the Horizon, having equal Declination, and the ſame Kind with the Sun, for the ſame Latitude.

Therefore the half Continuance of a Star above the Horizon (found in theſe Tables as before directed) added to, and ſubtracted from the Time of the Star's coming to, or on the Meridian; the firſt is the Star's Setting, the latter it's Riſing.

Examples of this Nature you will find in the Uſe of the next Table of Semidiurnal and Seminocturnal Arches, to which you are referred.

The Amplitude of a Star by the foregoing Tables is found as the Amplitude of the Sun was, which is more fully treated on in the Uſe of the Tables of Amplitude, in *Page* 146.

Aſtronomic TABLES *of* Semidiurnal *and* Seminocturnal Arches: *Shewing the true Time of the* SUN's *Riſing and Setting; with the Length of the Day and Night, for any Day in the Year; fitting all Places in the World, where the Pole is not elevated above* 60 *Degrees, either North or South; and to laſt with Exactneſs, as long as God upholdeth the Courſe of Nature.*

A TABLE *ſhewing the Semidiurnal Arch, or Time of Sun-ſetting, when the Sun hath North Declination; and the Seminocturnal Arch, or Time of Sun-riſing, when the Sun hath South Declination.*

The Degrees of Latitude.

Sun's Decli.	1		2		3		4		5		6	
	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M,
0	06	00	06	00	06	00	06	00	06	00	06	00
1	06	00	06	00	06	00	06	00	06	00	06	00
2	06	00	06	00	06	00	06	00	06	01	06	01
3	06	00	06	00	06	01	06	01	06	01	06	01
4	06	00	06	00	06	01	06	01	06	01	06	02
5	06	00	06	00	06	01	09	01	06	02	06	02
6	06	00	06	01	06	01	06	02	06	02	06	03
7	06	00	06	01	06	01	06	02	06	02	06	03
8	06	00	06	01	06	02	06	02	06	03	06	03
9	06	01	06	01	06	02	06	03	06	03	06	04
10	06	01	06	01	06	02	06	03	06	04	06	04
11	06	01	06	01	06	02	06	03	06	04	06	05
12	06	01	06	02	06	02	06	03	06	04	06	05
13	06	01	06	02	06	03	06	04	06	05	06	06
14	06	01	06	02	06	03	06	04	06	05	06	06
15	06	01	06	02	06	03	06	04	06	05	06	06
16	06	01	06	02	06	03	06	05	06	06	06	07
17	06	01	06	02	06	04	06	05	06	06	06	07
18	06	01	06	03	06	04	06	05	06	07	06	08
19	06	01	06	03	06	04	06	05	06	07	06	08
20	06	01	06	03	06	04	06	06	06	07	06	09
21	06	02	06	03	06	05	06	06	06	08	06	09
22	06	02	06	03	06	05	06	06	06	08	06	10
23	06	02	06	03	06	05	06	07	06	09	06	10
23,29	06	02	06	04	06	05	06	07	06	09	06	11

Degrees of Declination.

A TABLE *ſhewing the Semidiurnal Arch, or Time of Sun-ſetting, when the Sun hath North Declination; and the Seminocturnal Arch, or Time of Sun-riſing, when the Sun hath South Declination.*

The Degrees of Latitude.

Sun's Declin.	7		8		9		10		11		12	
Degrees of Declination.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.
0	06	00	06	00	06	00	06	00	06	00	06	00
1	06	00	06	00	06	01	06	01	06	01	06	01
2	06	01	06	01	06	01	06	01	06	02	06	02
3	06	01	06	02	06	02	06	02	06	02	06	03
4	06	02	06	02	06	02	06	03	06	03	06	04
5	06	02	06	03	06	03	06	04	06	04	06	04
6	06	03	06	03	06	04	06	04	06	05	06	05
7	06	03	06	04	06	04	06	05	06	05	06	06
8	06	04	06	04	06	05	06	06	06	06	06	07
9	06	04	06	05	06	06	06	06	06	07	06	08
10	06	05	06	06	06	06	06	07	06	08	06	09
11	06	05	06	06	06	07	06	08	06	09	06	09
12	06	06	06	07	06	08	06	09	06	09	06	10
13	06	06	06	07	06	08	06	09	06	10	06	11
14	06	07	06	08	06	09	06	10	06	11	06	12
15	06	08	06	09	06	10	06	11	06	12	06	13
16	06	08	06	09	06	10	06	12	06	13	06	14
17	06	09	06	10	06	11	06	12	06	14	06	15
18	06	09	06	10	06	12	06	13	06	14	06	16
19	06	10	06	11	06	13	06	14	06	15	06	17
20	06	10	06	12	06	14	06	15	06	16	06	18
21	06	11	06	12	06	14	06	16	06	17	06	19
22	06	11	06	13	06	15	06	16	06	18	06	20
23	06	12	06	14	06	15	06	17	06	19	06	21
23,29	06	12	06	14	06	16	06	17	06	19	06	21

A TABLE *ſhewing the Semidiurnal Arch, or Time of Sun-ſetting, when the Sun hath North Declination; and the Seminocturnal Arch, or Time of Sun-riſing, when the Sun hath South Declination.*

The Degrees of Latitude.

Sun's Decli.	13		14		15		16		17		18	
	H.	M.	H.	M.	H.	M.	H.	M.	H.	M	H.	M.
0	06	00	06	00	06	00	06	00	06	00	06	00
1	06	01	06	01	06	01	06	01	06	01	06	01
2	06	02	06	02	06	02	06	02	06	02	06	02
3	06	03	06	03	06	03	06	03	06	04	06	04
4	06	04	06	04	06	04	06	05	06	05	06	05
5	06	05	06	05	06	05	06	06	06	06	06	06
6	06	06	06	06	06	06	06	07	06	07	06	08
7	06	06	06	07	06	07	06	08	06	09	06	09
8	06	07	06	08	06	09	06	09	06	10	06	10
9	06	08	06	09	06	10	06	10	06	11	06	12
10	06	09	06	10	06	11	06	12	06	12	06	13
11	06	10	06	11	06	12	06	13	06	13	06	14
12	06	11	06	12	06	13	06	14	06	15	06	16
13	06	12	06	13	06	14	06	15	06	16	06	17
14	06	13	06	14	06	15	06	16	06	17	06	19
15	06	14	06	15	06	16	06	18	06	19	06	20
16	06	15	06	16	06	18	06	19	06	20	06	21
17	06	16	06	17	06	19	06	20	06	21	06	22
18	06	17	06	19	06	20	06	21	06	23	06	24
19	06	18	06	20	06	21	06	23	06	24	06	26
20	06	19	06	21	06	22	06	24	06	25	06	27
21	06	20	06	22	06	24	06	25	06	27	06	29
22	06	21	06	23	06	25	06	27	06	28	06	30
23	06	22	06	24	06	26	06	28	06	30	06	32
23,29	06	23	06	25	06	27	06	29	06	31	06	33

Degrees of Declination.

A TABLE *ſhewing the Semidiurnal Arch, or Time of Sun-ſetting, when the Sun hath North Declination; and the Seminocturnal Arch, or Time of Sun-riſing, when the Sun hath South Declination.*

The Degrees of Latitude.

Sun's Declin. / Degrees of Declination.	19		20		21		22		23		24	
	H	M	H	M	H	M	H	M	H	M	H	M
0	06	00	06	00	06	00	06	00	06	00	06	00
1	06	01	06	01	06	01	06	02	06	02	06	02
2	06	03	06	03	06	03	06	03	06	03	06	03
3	06	04	06	04	06	05	06	05	06	05	06	05
4	06	05	06	06	06	06	06	06	06	07	06	07
5	06	07	06	07	06	08	06	08	06	09	06	09
6	06	08	06	09	06	09	06	10	06	10	06	11
7	06	10	06	10	06	11	06	11	06	12	06	13
8	06	11	06	12	06	12	06	13	06	14	06	14
9	06	13	06	13	06	14	06	15	06	15	06	16
10	06	14	06	15	06	16	06	16	06	17	06	18
11	06	15	06	16	06	17	06	18	06	19	06	20
12	06	17	06	18	06	19	06	20	06	21	06	22
13	06	18	06	19	06	20	06	21	06	23	06	24
14	06	20	06	21	06	22	06	23	06	24	06	25
15	06	21	06	22	06	24	06	25	06	26	06	27
16	06	23	06	24	06	25	06	27	06	28	06	29
17	06	24	06	25	06	27	06	28	06	30	06	31
18	06	26	06	27	06	29	06	30	06	32	06	33
19	06	27	06	29	06	30	06	32	06	34	06	35
20	06	28	06	30	06	32	06	34	06	36	06	37
21	06	20	06	32	06	34	06	36	06	37	06	39
22	06	31	06	33	06	35	06	37	06	39	06	41
23	06	33	06	35	06	37	06	39	06	41	06	43
23,29	06	34	06	36	06	38	06	40	06	42	06	44

A TABLE *ſhewing the Semidiurnal Arch, or Time of Sun-ſetting, when the Sun hath North Declination; and the Seminocturnal Arch, or Time of Sun-riſing, when the Sun hath South Declination.*

	The Degrees of Latitude.											
Sun's Declin. Degrees of Declination.	25		26		27		28		29		30	
	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.
0	06	00	06	00	06	00	06	00	06	00	06	00
1	06	02	06	02	06	02	06	02	06	02	06	02
2	06	04	06	04	06	04	06	04	06	04	06	05
3	06	06	06	06	06	06	06	06	06	07	06	07
4	06	07	06	08	06	08	06	09	06	09	06	09
5	06	09	06	10	06	10	06	11	06	11	06	12
6	06	11	06	12	06	12	06	13	06	13	06	14
7	06	13	06	14	06	14	06	15	06	16	06	16
8	06	15	06	16	06	16	06	17	06	18	06	19
9	06	17	06	18	06	19	06	19	06	20	06	21
10	06	19	06	20	06	21	06	22	06	23	06	23
11	06	21	06	22	06	23	06	24	06	25	06	26
12	06	23	06	24	06	25	06	26	06	27	06	28
13	06	25	06	26	06	27	06	28	06	29	06	31
14	06	27	06	28	06	29	06	30	06	32	06	33
15	06	29	06	30	06	31	06	33	06	34	06	36
16	06	31	06	32	06	34	06	35	06	37	06	38
17	06	33	06	34	06	36	06	37	06	39	06	41
18	06	35	06	36	06	38	06	40	06	42	06	43
19	06	37	06	39	06	40	06	42	06	44	06	46
20	06	39	06	41	06	43	06	45	06	47	06	48
21	06	41	06	43	06	45	06	47	06	49	06	51
22	06	43	06	45	06	48	06	50	06	52	06	54
23	06	46	06	48	06	50	06	52	06	54	06	57
23,29	06	47	06	49	06	51	06	53	06	55	06	58

A TABLE *ſhewing the Semidiurnal Arch, or Time of Sun-ſetting, when the Sun hath North Declination; and the Seminocturnal Arch, or Time of Sun-riſing, when the Sun hath South Declination.*

The Degrees of Latitude.

Sun's Declin.	31		32		33		34		35		36	
	H	M	H	M	H	M	H	M	H	M	H	M
0	06	00	06	00	06	00	06	00	06	00	06	00
1	06	02	06	02	06	03	06	03	06	03	06	03
2	06	05	06	05	06	05	06	05	06	06	06	06
3	06	07	06	08	06	08	06	08	06	08	06	09
4	06	10	06	10	06	10	06	11	06	11	06	12
5	06	12	06	13	06	13	06	14	06	14	06	15
6	06	15	06	15	06	16	06	16	06	17	06	18
7	06	17	06	18	06	18	06	19	06	20	06	20
8	06	19	06	20	06	21	06	22	06	23	06	23
9	06	22	06	23	06	24	06	25	06	25	06	26
10	06	24	06	25	06	26	06	27	06	28	06	29
11	06	27	06	28	06	29	06	30	06	31	06	32
12	06	29	06	31	06	32	06	33	06	34	06	36
13	06	32	06	33	06	34	06	36	06	37	06	39
14	06	34	06	36	06	37	06	39	06	40	06	42
15	06	37	06	39	06	40	06	42	06	43	06	45
16	06	40	06	41	06	43	06	45	06	46	06	48
17	06	42	06	44	06	46	06	48	06	49	06	51
18	06	45	06	47	06	49	06	51	06	53	06	55
19	06	48	06	50	06	52	06	54	06	56	06	58
20	06	51	06	53	06	55	06	57	06	59	07	01
21	06	53	06	56	06	58	07	00	07	02	07	05
22	06	56	06	58	07	01	07	03	07	06	07	08
23	06	59	07	01	07	04	07	06	07	09	07	12
23,29	07	01	07	03	07	06	07	08	07	11	07	14

Degrees of Declination.

A TABLE *ſhewing the Semidiurnal Arch, or Time of Sun-ſetting, when the Sun hath North Declination; and the Seminocturnal Arch, or Time of Sun-riſing, when the Sun hath South Declination.*

The Degrees of Latitude.

Sun's Declin.	37		38		39		40		41		42	
	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.
0	06	00	06	00	06	00	06	00	06	00	06	00
1	06	03	06	03	06	03	06	03	06	03	06	04
2	06	06	06	06	06	06	06	07	06	07	06	07
3	06	09	06	09	06	10	06	10	06	10	06	11
4	06	12	06	13	06	13	06	13	06	14	06	14
5	06	15	06	16	06	16	06	17	06	17	06	18
6	06	18	06	19	06	20	06	20	06	21	06	22
7	06	21	06	22	06	23	06	24	06	25	06	25
8	06	24	06	25	06	26	06	27	06	28	06	29
9	06	27	06	28	06	29	06	31	06	32	06	33
10	06	31	06	32	06	32	06	34	06	35	06	37
11	06	34	06	35	06	36	06	38	06	39	06	40
12	06	37	06	38	06	40	06	41	06	43	06	44
13	06	40	06	42	06	43	06	45	06	46	06	48
14	06	43	06	45	06	47	06	48	06	50	06	52
15	06	47	06	48	06	50	06	52	06	54	06	56
16	06	50	06	52	06	54	06	56	06	58	07	00
17	06	33	06	55	06	57	07	00	07	02	07	04
18	06	57	06	59	07	01	07	03	07	06	07	08
19	07	00	07	02	07	05	07	07	07	10	07	12
20	07	04	07	06	07	09	07	11	07	14	07	17
21	07	07	07	10	07	12	07	15	07	18	07	21
22	07	11	07	14	07	16	07	19	07	22	07	25
23	07	15	07	17	07	20	07	23	07	27	07	30
23,29	07	17	07	19	07	22	07	25	07	29	07	32

Degrees of Declination.

A TABLE *ſhewing the Semidiurnal Arch, or Time of Sun-ſetting, when the Sun hath North Declination; and the Seminocturnal Arch, or Time of Sun-riſing, when the Sun hath South Declination.*

The Degrees of Latitude.

Sun's Declin. Degrees of Declination.	43		44		45		46		47		48	
	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.
0	06	00	06	00	06	00	06	00	06	00	06	00
1	06	04	06	04	06	04	06	04	06	04	06	04
2	06	07	06	08	06	08	06	08	06	09	06	09
3	06	11	06	12	06	12	06	12	06	13	06	13
4	06	15	06	15	06	16	06	17	06	17	06	18
5	06	19	06	19	06	20	06	21	06	22	06	22
6	06	22	06	23	06	24	06	25	06	26	06	27
7	06	26	06	27	06	28	06	29	06	30	06	31
8	06	30	06	31	06	32	06	33	06	35	06	36
9	06	34	06	35	06	36	06	38	06	39	06	41
10	06	38	06	39	06	41	06	42	06	43	06	45
11	06	42	06	43	06	45	06	46	06	48	06	50
12	06	46	06	47	06	49	06	51	06	53	06	55
13	06	50	06	52	06	53	06	55	06	57	06	59
14	06	54	06	56	06	58	07	00	07	02	07	04
15	06	58	07	00	07	02	07	04	07	07	07	09
16	07	02	07	04	07	07	07	09	07	12	07	14
17	07	06	07	09	07	11	07	14	07	17	07	19
18	07	11	07	13	07	16	07	19	07	22	07	25
19	07	15	07	18	07	21	07	24	07	27	07	30
20	07	19	07	22	07	25	07	29	07	32	07	35
21	07	24	07	27	07	30	07	34	07	37	07	41
22	07	28	07	31	07	35	07	39	07	43	07	47
23	07	33	07	36	07	40	07	44	07	48	07	53
23,29	07	36	07	39	07	43	07	47	07	51	07	56

A TABLE *ſhewing the Semidiurnal Arch, or Time of Sun-ſetting, when the Sun hath North Declination*; *and the Seminocturnal Arch, or Time of Sun-riſing, when the Sun hath South Declination.*

The Degrees of Latitude.

Sun's Declin. Degrees of Declination.	49		50		51		52		53		54	
	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.
0	06	00	06	00	06	00	06	00	06	00	06	00
1	06	05	06	05	06	05	06	05	06	05	06	06
2	06	09	06	10	06	10	06	10	06	11	06	11
3	06	14	06	14	06	15	06	15	06	16	06	17
4	06	18	06	19	06	20	06	21	06	21	06	22
5	06	23	06	24	06	25	06	26	06	27	06	28
6	06	28	06	29	06	30	06	31	06	32	06	33
7	06	32	06	34	06	35	06	36	06	38	06	39
8	06	37	06	39	06	40	06	41	06	43	06	45
9	06	42	06	44	06	45	06	47	06	49	06	50
10	06	47	06	49	06	50	06	52	06	54	06	56
11	06	52	06	54	06	56	06	58	07	00	07	02
12	06	57	06	59	07	01	07	03	07	06	07	08
13	07	02	07	04	07	06	07	09	07	11	07	14
14	07	07	07	09	07	12	07	14	07	17	07	20
15	07	12	07	14	07	17	07	20	07	23	07	27
16	07	17	07	20	07	23	07	26	07	29	07	33
17	07	22	07	25	07	29	07	32	07	36	07	40
18	07	28	07	31	07	35	07	38	07	42	07	46
19	07	33	07	37	07	41	07	45	07	49	07	52
20	07	39	07	43	07	47	07	51	07	56	08	00
21	07	45	07	49	07	53	07	58	08	03	08	08
22	07	51	07	55	08	00	08	05	08	10	08	15
23	07	57	08	02	08	06	08	12	08	17	08	23
23,29	08	00	08	05	08	10	08	16	08	21	08	27

A TABLE *ſhewing the Semidiurnal Arch, or Time of Sun-ſetting, when the Sun hath North Declination; and the Seminocturnal Arch, or Time of Sun-riſing, when the Sun hath South Declination.*

	The Degrees of Latitude.											
Sun's Declin. Degrees of Declination.	55		56		57		58		59		60	
	H.	M.	H.	M.	H.	M.	H.	M.	H.	M.	I	
0	06	00	06	00	06	00	06	00	06	00	06	00
1	06	06	06	06	06	06	06	06	06	07	06	07
2	06	11	06	12	06	12	06	13	06	13	06	14
3	06	17	06	18	06	19	06	19	06	20	06	21
4	06	23	06	24	06	25	06	26	06	27	06	28
5	06	29	06	30	06	31	06	32	06	33	06	35
6	06	35	06	36	06	37	06	39	06	40	06	42
7	06	40	06	42	06	44	06	45	06	47	06	49
8	06	46	06	48	06	50	06	52	06	54	06	56
9	06	52	06	54	06	56	06	59	07	01	07	04
10	06	58	07	00	07	03	07	06	07	08	07	11
11	07	04	07	07	07	10	07	13	07	16	07	19
12	07	11	07	13	07	16	07	20	07	23	07	26
13	07	17	07	20	07	23	07	27	07	30	07	34
14	07	23	07	27	07	30	07	34	07	38	07	42
15	07	30	07	34	07	38	07	42	07	46	07	51
16	07	37	07	41	07	45	07	49	07	54	07	59
17	07	44	07	48	07	52	07	57	08	03	08	08
18	07	51	07	55	08	00	08	05	08	11	08	17
19	07	58	08	03	08	08	08	14	08	20	08	26
20	08	05	08	11	08	16	08	22	08	29	08	36
21	08	13	08	19	08	25	08	32	08	39	08	47
22	08	21	08	27	08	34	08	41	08	49	08	58
23	08	29	08	32	08	43	08	51	09	00	09	09
23,29	08	33	08	41	08	48	08	50	09	05	09	16

The Uſe of the foregoing TABLES of *Semidiurnal* and *Seminocturnal Arches.*

To find the Time of the Sun's Riſing and Setting, and the Length of the Day, and of the Night, by theſe Tables.

FIRST, ſeek the Sun's Declination in the Tables of Declination for the Day propoſed; with which enter the Tables of Semidiurnal and Seminocturnal Arches; finding the Latitude of the Place in the Head of the Table, and the Degrees of the Sun's Declination in the firſt Column on the Left-hand; and in the common Angle of Meeting is the Semidiurnal Arch, if the Sun hath North Declination; but its Seminocturnal Arch, if the Sun hath South Declination.

Example 1. For Illuſtration hereof, let it be required to find the Time of the Sun's Riſing, Setting, and the Length of the Day and Length of the Night, for the 4th Day of *May*, 1766, in Latitude 46 Degrees North?

At which Time the Sun's Declination is 16 deg. 3 min. North; with which enter the Table, as is before declared, and the Semidiurnal Arch is 7 Hours 9 Min. the true Time of Sun-ſetting; whoſe Complement to 12 Hours is the Seminocturnal Arch, or the Time of the Sun-riſing, and is 4 Hours 51 Minutes; double the Semidiurnal Arch you have the Length of the Day; double the Seminocturnal Arch, the Aggregate is the Length of the Night. See the Work following.

	H.	M.
	12	: 00
The Semidiurnal Arch, or Time of Sun-ſetting	07	: 09
The Complement to 12 Hours is - - - - - - - -	04	: 51

The Seminocturnal Arch, or Time of the Sun-riſing, in Latitude 46 Degrees North, is 4 Hours 51 Minutes.

The

	H.	M.
The Semidiurnal Arch doubled - - - - - - - -	07	09
	07	09
The Length of the Day, *May* 4, 1766, is ——	14	18
The Seminocturnal Arch doubled - - - - - - -	04	51
	04	51
The Length of the Night, *May* 4, 1766, is ——	09	42

Example 2. But when the Sun hath 16 deg. 03 min. South Declination, in this Latitude of 46 deg. North; then the Day-Arch will become the Night-Arch, and the Night-Arch will become the Day-Arch.

As, on *Nov.* 6, 1763, the Sun hath 16 deg. 01 min. South Declination; then the Time of the Sun's Riſing is 7 Hours 9 Minutes, his Setting 4 Hours 51 Minutes; the Length of the Day 9 Hours 42 Minutes, and the Length of the Night 14 Hours 18 Minutes.

Example 3. Let it be required to find the Time of the Sun's Riſing and Setting, with the Length of the Day and Night, for the 26th of *December*, 1764, in Latitude 53 deg. North; at which Time the Sun's Declination is 23 deg. 22 min. South?

	H.	M.
	12	00
The Seminocturnal Arch, or Time of Sun-riſing	08	20
The Complement to 12 Hours is - - - - - - - -	03	40

And is the Semidiurnal Arch, or Time of Sun-ſetting.

	H.	M.
The Seminocturnal Arch doubled - - - - - -	03	40
	03	40
The Length of the Day, *December* 26, 1764, is	07	20
The Seminocturnal Arch doubled - - - - - -	08	20
	08	20
The Length of the Night, *December* 26, 1764, is	16	40

Theſe Tables will ſerve as well in South Latitude as in North, with this Alteration only; When in South Latitude, then uſe South Decſination there, as you do North Declination here, in North Latitude.

For then theſe Tables ſhew the Semidiurnal Arch, or the Time of Sun-riſing, when the Sun hath South Declination; and the Seminocturnal Arch, or the Time of Sun-ſetting, when the Sun hath North Declination.

Example 4. Let it be required to find the Time of the Sun's Riſing and Setting, with the Length of the Day and Night, for the 4th of *May*, 1765. in Latitude 46 Degrees South.

At which Time the Sun's Declination is 16 Degrees 07 Minutes North; with which enter the Table, and the Seminocturnal Arch is 7 Hours 9 Minutes the Time of Sun-riſing; whoſe Complement to 12 Hours is the Semidiurnal Arch, or Time of Sun-ſetting, which is at 51 Minutes paſt 4 of the Clock.

	H.	M.
The Seminocturnal Arch doubled - - - - - - -	07 07	09 09
The Length of the Night, *May* 4, 1765. in Latitude 46 Degrees South - - - - - - - - -	14	18
The Semidiurnal Arch doubled - - - - - - - -	04 04	51 51
The Length of the Day, the 4th of *May*, 1765. Latitude 46 Degrees South - - - -	09	42

Example 5. Let it be required to find the Time of the Sun's Riſing and Setting, with the Length of the Day and Night, for the 26th of *December*, 1763. in Latitude 53 Degrees South. At which Time the Sun's Declination is 23 deg. 24 min. South; with which enter the Table of Semidiurnal Arches, &c. and you will find as follows.

H. M.

	H.	M.
	12	: 00
The Semidiurnal Arch, or Time of Sun-ſetting	08	: 20
The Seminocturnal Arch, or Time of Sun-riſing	03	: 40
The Length of the Day - - - - - - - - - - - - -	16	: 40
Length of the Night, *December* 26, 1763. Latitude 53 Degrees South - - - - - - - - -	07	: 20

To find the Time of a Star's Riſing or Setting.

BY theſe Tables the Time of the Riſing and Setting of all the Stars in the Heavens (whoſe Declinations do not exceed the Sun's greateſt Declination,) in any Latitude that the Tables contain, and at any Time of the Year, is found in this Manner.

If the Star hath North Declination, and you in North Latitude, look for the Latitude in the Head in the Table, the Declination on the Left-hand, and in the common Angle of meeting is the Star's Semiapparent Arch, or half the Time of the Star's Continuance above the Horizon, in that Latitude; or the ſpace of Time which that Star takes in aſcending from the Horizon to the Meridian, on the Eaſt-ſide; likewiſe deſcending from the Meridian, to the Horizon, on the Weſt-ſide of the Meridian. Now, if you ſubtract theſe Hours and Minutes from the Time of the Star's coming to the Meridian, the Remainder will be the Time of the Star's Riſing: and if you add, the Sum will be the true Time of the Star's Setting.

Example 6. Let it be required to find the Time of the Riſing and Setting of the *Bull's Eye*, *November* the 30th, n the Latitude of 52 Degrees North: The Declination f this Star is 16 deg. North; the 30th Day of *No-* *ember* this Star cometh on the Meridian at 56 Minutes aſt 11 of the Clock at Night.

H. M.

	H.	M.
The Time of the Star's Southing - - - - - - - -	11	56
The Semi-apparent Arch, ſubtract - - - - - - -	07	26
Time of the Star's Riſing in the Evening - - -	04	30
Time of the Star's Setting in the Morning - -	07	22

Note 1. If the Sum of the Addition exceed 12 Hours, caſt away 12 Hours; the Surplus is the Star's Setting.

2. And when you can't ſubtract, add 12 Hours to the Star's Southing, and then ſubtract: What remains is it's Riſing.

Example 7. I deſire to know the Time of the Riſing and Setting of the *Bull's-Eye*, the 30th Day of *November*, in the Latitude of 13 degrees North: The Declination of the *Bull's Eye* 16 deg. North?

	H.	M.
The Time of the Star's Southing - - - - - - -	11	56
The Semi-apparent Arch, ſubtract - - - - - - -	06	15
The Time of his Riſing in the Evening - - -	05	41
The Time of his Setting in the Morning - - -	06	11

If the Star hath South Declination, and you in North Latitude look (as before) the Latitude in the Head of the Table, the Declination on the Left-ſide, and in the common Angle of Meeting is the Star's Semi-depreſſed Arch; which ſubtract from 12 Hours, the Remainder is the Star's Semi-apparent Arch, or half the Time that the Star doth continue above the Horizon in that Latitude: Therefore ſubtract thoſe Hours and Minutes from the Time of the Star's coming to the Meridian, adding 12 Hours to the Star's Southing, if otherwiſe Subtraction cannot be made, the Remainder will be the Time of the Star's Riſing; and if you add, the Sum will be the Time of the Star's Setting.

Example 8. Let it be required to find the Time of the Riſing and Setting of the Bright Star in the *Great Dog's Mouth*, the 15th Day of *November*, in the Latitude of 50 deg. North. The Declination of the *Great Dog's Mouth*, is 16d. 24m. South, and its Southing is 3 Hours 12 min. in the Morning, the 15th of *November*.

	H.	M.
The Time of the Star's Southing is	03	12
To it add	12	00
The Sum is	15	12
The Semi-depreſs'd Arch, by the Table is	07	22
Which ſubtract from	12	00
The Remainder is the Semi-apparent Arch	04	38
Time of Southing with 12 Hours added is	15	12
The Semi-apparent Arch, ſubtract	04	38
Time of the Star's Riſing in the Evening	10	34
Time of the Star's Setting from Noon, or 50 min. paſt 7 in the Morning	19	50

Example 9. I deſire to know the Riſing and Setting of the *Great Dog* the 15th of *November*, in the Latitude of 30 Degrees North.

	H.	M.
Time of Southing with 12 Hours added	15	12
The Semi-apparent Arch, ſubtract	06	39
Time of the Star's Riſing in the Evening	08	33
Time of the Star's Setting in the Morning, when 12 Hours is ſubtracted	9	51

In South Latitude, to know the Time of the Riſing and Setting of the Stars.

Proceed with thoſe Stars that have North Declination in a South Latitude, as with Stars that have South Declination in North Latitude.

Example 10. Let it be required to find the Time of the Riſing and Setting of the *Bull's Eye* the 18th Day of *November*, in the Latitude of 42 deg. South.

The Declination of this Star is 16 deg. 00 min. North: The 18th Day of *November*, this Star cometh upon the Meridian at 47 min. paſt 12 in the Morning.

	H.	M.
The Semi-depreſs'd Arch, by the Table is - -	07	00
Which ſubtract from - - - - - - - - - - - - - - -	12	00
The Remainder is the Semi-apparent Arch - - -	05	00
The Time of the Star's Northing is - - - - - -	12	47
The Semi-apparent Arch, ſubtract - - - - - - -	05	00
Time of the Star's Riſing in the Evening - - -	07	47
Time of the Star's Setting in the Morning - -	05	47

In like manner the Riſing and Setting of any Star (whoſe Declination exceedeth not the Sun's greateſt) may be found in any Latitude, from the Equinoctial to 60 Degrees, either North or South.

ASTRONOMIC

TABLES;

SHEWING

The Points of the Compaſs *that the* Sun *and* Stars *Riſe and Set upon.*

Being of excellent Uſe for readily finding the Variation o the Compaſs; and may be performed by an ordinary Meridian Compaſs, but more exactly by an Azimuth Compaſs.

Fitting all Parts of the World, where the Pole is no elevated above 60 deg. either North or South.

Latitud

Latitude 0 Degree.

North Dec.		Dec.	South Dec.	
☉ri	☉ſet	d.m.	☉ri	☉ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		2.49	1	
2		5.37	2	
3		8.26	3	
ebn	wbn	11.15	ebs	wbs
1		14.04	1	
2		16.52	2	
3		19.41	3	
ene	wnw	22.30	eſe	wſw

Latitude 1 Degree.

North Dec		Dec.	South Dec.	
☉ri	☉ſet	d.m.	☉ri	☉ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		2.49	1	
2		5.37	2	
3		8.26	3	
ebn	wbn	11.15	ebs	wbs
1		14.04	1	
2		16.52	2	
3		19.41	3	
ene	wnw	22.30	eſe	wſw

Latitude 2 Degrees.

North Dec.		Dec.	South Dec.	
☉ri	☉ſet	d.m.	☉ri	☉ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		2.49	1	
2		5.37	2	
3		8.26	3	
ebn	wbn	11.15	ebs	wbs
1		14.04	1	
2		16.52	2	
3		19.40	3	
ene	wnw	22.29	eſe	wſw

Latitude 3 Degrees.

North Dec.		Dec.	South Dec.	
☉ri	☉ſet	d.m.	☉ri	☉ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		2.49	1	
2		5.37	2	
3		8.25	3	
ebn	wbn	11.14	ebs	wbs
1		14.03	1	
2		16.51	2	
3		19.39	3	
ene	wnw	22.27	eſe	wſw

Latitude 4 Degrees

North Dec.	Dec	South Dec.
☉ri | ☉ſet	d. m.	☉ri | ☉ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	2.48	1
2	5.37	2
3	8.25	3
e b n w b n	11.14	e b s w b s
1	14.02	1
2	16.50	2
3	19.38	3
e n e w n w	22.25	e s e w s w

Latitude 5 Degrees

North Dec	Dec	South Dec.
☉ri | ☉ſet	d. m.	☉ri | ☉ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	2.48	1
2	5.36	2
3	8.24	3
e b n w b n	11.12	e b s w b s
1	14.01	1
2	16.49	2
3	19.36	3
e n e w n w	22.23	e s e w s w

Latitude 6 Degrees.

North Dec.	Dec.	South Dec.
☉ri | ☉ſet	d. m.	☉ri | ☉ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	2.48	1
2	5.36	2
3	8.23	3
e b n w b n	11.11	e b s w b s
1	13 59	1
2	16.47	2
3	19.32	3
e n e w n w	22.21	e s e w s w

Latitude 7 Degrees.

North Dec.	Dec.	South Dec.
☉ri | ☉ſet	d. m	☉ri | ☉ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	2.48	1
2	5.35	2
3	8.22	3
e b n w b n	11.09	e b s w b s
1	13.57	1
2	16.45	2
3	19.32	3
e n e w n w	22.19	e s e w s w

Latitude 8 Degrees.

North Dec.		Dec.	South Dec.	
☉ ri	☉ ſet	d.m.	☉ ri	☉ ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		2.47	1	
2		5.35	2	
3		8.21	3	
ebn	wbn	11.08	ebs	wbs
1		13.55	1	
2		16.42	2	
3		19.29	3	
ene	wnw	22.16	ese	wsw

Latitude 9 Degrees.

North Dec		Dec.	South Dec.	
☉ ri	☉ ſet	d.m.	☉ ri	☉ ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		2.47	1	
2		5.33	2	
3		8.20	3	
ebn	wbn	11.06	ebs	wbs
1		13.53	1	
2		16.40	2	
3		19.26	3	
ene	wnw	22.12	ese	wsw

Latitude 10 Degrees.

North Dec.		Dec.	South Dec.	
☉ ri	☉ ſet	d.m.	☉ ri	☉ ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		2.46	1	
2		5.32	2	
3		8.18	3	
ebn	wbn	11.04	ebs	wbs
1		13.50	1	
2		16.37	2	
3		19.22	3	
ene	wnw	22.08	ese	wsw

Latitude 11 Degrees.

North Dec.		Dec.	South Dec.	
☉ ri	☉ ſet	d.m.	☉ ri	☉ ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		2.46	1	
2		5.31	2	
3		8.17	3	
ebn	wbn	11.03	ebs	wbs
1		13.48	1	
2		16.33	2	
3		19.18	3	
ene	wnw	22.03	ese	wsw

Latitude 12 Degrees.

North Dec.		Dec.	South Dec.	
⊙ ri	⊙ ſet	d. m.	⊙ ri	⊙ ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		2.45	1	
2		5.30	2	
3		8.15	3	
e b n	w b n	11.00	e b s	w b s
1		13.45	1	
2		16.30	2	
3		19.14	3	
e n e	w n w	21.58	e s e	w s w

Latitude 13 Degrees.

North Dec.		Dec	South Dec.	
⊙ ri	⊙ ſet	d. m.	⊙ ri	⊙ ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		2.45	1	
2		5.29	2	
3		8.13	3	
e b n	w b n	10.57	e b s	w b s
1		13.42	1	
2		16.26	2	
3		19.10	3	
e n e	w n w	21.52	e s e	w s w

Latitude 14 Degrees.

North Dec.		Dec.	South Dec.	
⊙ ri	⊙ ſet	d. m.	⊙ ri	⊙ ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		2.44	1	
2		5.28	2	
3		8.11	3	
e b n	w b n	10.55	e b s	w b s
1		13.38	1	
2		16.22	2	
3		19.04	3	
e n e	w n w	21.47	e s e	w s w

Latitude 15 Degrees.

North Dec.		Dec.	South Dec.	
⊙ ri	⊙ ſet	d. m.	⊙ ri	⊙ ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		2.43	1	
2		5.26	2	
3		8.09	3	
e b n	w b n	10.52	e b s	w b s
1		13.35	1	
2		16.17	2	
3		18.59	3	
e n e	w n w	21.41	e s e	w s w

Latitude 16 Degrees.

North Dec.		Dec.	South Dec.	
⊙ri	⊙ſet	d. m.	⊙ri	⊙ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		2.42	1	
2		5.25	2	
3		8.06	3	
e b n	w b n	10.49	e b s	w b s
1		13.31	1	
2		16.12	2	
3		18.53	3	
e n e	w n w	21.34	e s e	w s w

Latitude 17 Degrees.

North Dec.		Dec.	South Dec.	
⊙ri	⊙ſet	d. m.	⊙ri	⊙ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		2.42	1	
2		5.23	2	
3		8.04	3	
e b n	w b n	10.45	e b s	w b s
1		13.29	1	
2		16.08	2	
3		18.47	3	
e n e	w n w	21.27	e s e	w s w

Latitude 18 Degrees.

North Dec.		Dec.	South Dec.	
⊙ri	⊙ſet	d. m.	⊙ri	⊙ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		2.41	1	
2		5.21	2	
3		8.01	3	
e b n	w b n	10.42	e b s	w b s
1		13.22	1	
2		16.02	2	
3		18.40	3	
e n e	w n w	21.20	e s e	w s w

Latitude 19 Degrees.

North Dec.		Dec.	South Dec.	
⊙ri	⊙ſet	d. m.	⊙ri	⊙ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		2.40	1	
2		5.19	2	
3		7.58	3	
e b n	w b n	10.38	e b s	w b s
1		13.17	1	
2		15.56	2	
3		18.34	3	
e n e	w n w	21.12	e s e	w s w

Latitude 20 Degrees.

North Dec.	Dec.	South Dec.
☉ ri ☉ ſet	d. m.	☉ ri ☉ ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	2.39	1
2	5.17	2
3	7.55	3
e b n w b n	10.34	e b s w b s
1	13.12	1
2	15.49	2
3	18.27	3
e n e w n w	21.04	e s e w s w

Latitude 21 Degrees.

North Dec.	Dec.	South Dec.
☉ ri ☉ ſet	d. m.	☉ ri ☉ ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	2.38	1
2	5.15	2
3	7.52	3
e b n w b n	10.30	e b s w b s
1	13.07	1
2	15.43	2
3	18.20	3
e n e w n w	20.55	e s e w s w
1	23.32	1

Latitude 22 Degrees.

North Dec.	Dec.	South Dec.
☉ ri ☉ ſet	d. m.	☉ ri ☉ ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	2.37	1
2	5.13	2
3	7.49	3
e b n w b n	10.25	e b s w b s
1	13.01	1
2	15.37	2
3	18.12	3
e n e w n w	20.46	e s e w s w
2	23.21	1

Latitude 23 Degrees.

North Dec.	Dec.	South Dec.
☉ ri ☉ ſet	d. m.	☉ ri ☉ ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	2.36	1
2	5.11	2
3	7.46	3
e b n w b n	10.21	e b s w b s
1	12.56	1
2	15.31	2
3	18.03	3
e n e w n w	20.37	e s e w s w
1	23.11	1

Latitude 24 Degrees.

North Dec.		Dec.	South Dec.	
⊙ ri	⊙ ſet	d. m.	⊙ ri	⊙ ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		2.34	1	
2		5.08	2	
3		7.42	3	
ebn	wbn	10.16	ebs	wbs
1		12.50	1	
2		15.23	2	
3		17.55	3	
ene	wnw	20.27	eſe	wſw
1		23.00	1	

Latitude 25 Degrees.

North Dec.		Dec.	South Dec.	
⊙ ri	⊙ ſet	d. m.	⊙ ri	⊙ ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		2.33	1	
2		5.06	2	
3		7.38	3	
ebn	wbn	10.11	ebs	wbs
1		12.43	1	
2		15.15	2	
3		17.46	3	
ene	wnw	20.17	eſe	wſw
1		22.48	1	

Latitude 26 Degrees.

North Dec.		Dec.	South Dec.	
⊙ ri	⊙ ſet	d. m.	⊙ ri	⊙ ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		2.32	1	
2		5.03	2	
3		7.35	3	
ebn	wbn	10.06	ebs	wbs
1		12.36	1	
2		15.08	2	
3		17.37	3	
ene	wnw	20.06	eſe	wſw
1		22.36	1	

Latitude 27 Degrees.

North Dec.		Dec.	South Dec.	
⊙ ri	⊙ ſet	d. m.	⊙ ri	⊙ ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		2.30	1	
2		5.00	2	
3		7.31	3	
ebn	wbn	10.01	ebs	wbs
1		12.30	1	
2		15.00	2	
3		17.28	3	
ene	wnw	19.55	eſe	wſw
1		22.23	1	

Latitude 28 Degrees.

North Dec.		Dec.	South Dec.	
☉ ri	☉ ſet	d. m.	☉ ri	☉ ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		2.29	1	
2		4.58	2	
3		7.27	3	
e b n	w b n	9.55	e b s	w b s
1		12 23	1	
2		14.51	2	
3		17.18	3	
ene	wnw	19.44	ese	wsw
1		22.11	1	

Latitude 29 Degrees.

North Dec.		Dec.	South Dec.	
☉ ri	☉ ſet	d. m.	☉ ri	☉ ſet
Eaſt	Weſt	0.50	Eaſt	Weſt
1		2.28	1	
2		4.55	2	
3		7.22	3	
e b n	w b n	9.50	e b s	w b s
1		12.16	1	
2		14.43	2	
3		17.08	3	
ene	wnw	19.32	e s e	wsw
1		21.58	1	

Latitude 30 Degrees.

North Dec.		Dec.	South Dec.	
☉ ri	☉ ſet	d. m.	☉ ri	☉ ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		2.27	1	
2		4.52	2	
3		7.18	3	
e b n	w b n	9.44	e b s	w b s
1		12.09	1	
2		14.34	2	
3		16.57	3	
ene	wnw	19.20	e s e	w s w
1		21.44	1	

Latitude 31 Degrees.

North Dec.		Dec.	South Dec.	
☉ ri	☉ ſet	d. m.	☉ ri	☉ ſet
Eaſt	Weſt	0 00	Eaſt	Weſt
1		2.25	1	
2		4.50	2	
3		7.13	3	
e b n	w b n	9.38	e b s	w b s
1		12.01	1	
2		14.25	2	
3		16,47	3	
ene	wnw	19.08	e s e	w s w
1		21.30	1	

Latitude 32 Degrees.

North Dec.	Dec.	South Dec.
☉ ri | ☉ ſet	d. m.	☉ ri | ☉ ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	2.33	1
2	4.46	2
3	7.08	3
e b n w b n	9.31	e b s w b s
1	11.54	1
2	14.15	2
3	16.36	3
e n e w n w	18.55	e s e w s w
1	21.16	1

Latitude 33 Degrees.

North Dec.	Dec.	South Dec.
☉ ri | ☉ ſet	d. m.	☉ ri | ☉ ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	2.22	1
2	4.43	2
3	7.04	3
e b n w b n	9.25	e b s w b s
1	11.46	1
2	14.06	2
3	16.24	3
e n e w n w	18.43	e s e w s w
1	21.01	1
2	23.17	2

Latitude 34 Degrees.

North Dec.	Dec.	South Dec.
☉ ri | ☉ ſet	d. m.	☉ ri | ☉ ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	2.20	1
2	4.40	2
3	6.59	3
e b n w b n	9.18	e b s w b s
1	11.38	1
2	13.56	2
3	16.13	3
e n e w n w	18.29	e s e w s w
1	20.46	1
2	23.00	2

Latitude 35 Degrees.

North Dec.	Dec.	South Dec.
☉ ri | ☉ ſet	d. m.	☉ ri | ☉ ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	2.18	1
2	4.37	2
3	6.54	3
e b n w b n	9.12	e b s w b s
1	11.29	1
2	13.46	2
3	16.02	3
e n e w n w	18.16	e s e w s w
1	20.30	1
2	22.43	2

Latitude 36 Degrees.

North Dec.	Dec.	South Dec.
☉ri | ☉ſet	d. m.	☉ri | ☉ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	2.16	1
2	4.33	2
3	6.49	3
e b n w b n	9 05	e b s w b s
1	11 20	1
2	13.35	2
3	15.49	3
e n e w n w	18.02	e s e w s w
1	20.15	1
2	22.25	2

Latitude 37 Degrees.

North Dec.	Dec.	South Dec.
☉ri | ☉ſet	d. m.	☉ri | ☉ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	2.15	1
2	4.30	2
3	6.43	3
e b n w b n	8.58	e b s w b s
1	11.12	1
2	13.25	2
3	15.36	3
e n e w n w	17.47	e s e w s w
1	19.58	1
2	22.07	2

Latitude 38 Degrees

North Dec.	Dec.	South Dec.
☉ri | ☉ſet	d. m.	☉ri | ☉ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	2.13	1
2	4.26	2
3	6.38	3
e b n w b n	8.50	e b s w b s
1	11.03	1
2	13.14	2
3	15.23	3
e n e w n w	17.32	e s e w s w
1	19.41	1
2	21.49	2

Latitude 39 Degrees.

North Dec.	Dec.	South Dec.
☉ri | ☉ſet	d. m.	☉ri | ☉ſet
Eaſt Weſt	0 00	Eaſt Weſt
1	2.11	1
2	4.22	2
3	6.32	3
e b n w b n	8.43	e b s w b s
1	10.53	1
2	13.03	2
3	15.10	3
e n e w n w	17 17	e s e w s w
1	19 25	1
2	21.30	2
3	23.32	3

Latitude 40 Degrees.

North Dec.		Dec.	South Dec.	
☉ ri	☉ ſet	d. m.	☉ ri	☉ ſet
Eaſt	Weſt	0 00	Eaſt	Weſt
1		2.09	1	
2		4.19	2	
3		6.27	3	
ebn	wbn	8.36	ebs	wbs
1		10.43	1	
2		12.51	2	
3		14.57	3	
ene	wnw	17.02	ese	wsw
1		19.07	1	
2		21.10	2	
3		23.11	3	

Latitude 41 Degrees.

North Dec.		Dec.	South Dec.	
☉ ri	☉ ſet	d. m	☉ ri	☉ ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		2.07	1	
2		4.15	2	
3		6.22	3	
ebn	wbn	8.28	ebs	wbs
1		10.34	1	
2		12 40	2	
3		14.44	3	
ene	wnw	16.47	ese	wsw
1		18.50	1	
2		20 51	2	
3		22.50	3	

Latitude 42 Degrees.

North Dec.		Dec.	South Dec.	
☉ ri	☉ ſet	d. m.	☉ ri	☉ ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		2.05	1	
2		4.11	2	
3		6.16	3	
ebn	wbn	8.20	ebs	wbs
1		10.24	1	
2		12 28	2	
3		14.30	3	
ene	wnw	16 31	ese	wsw
1		18.32	1	
2		20.31	2	
3		22.27	3	

Latitude 43 Degrees.

North Dec.		Dec.	South Dec.	
☉ ri	☉ ſet	d. m.	☉ ri	☉ ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		2.03	1	
2		4 07	2	
3		6.10	3	
ebn	wbn	8.12	ebs	wbs
1		10.14	1	
2		12 16	2	
3		14 16	3	
ene	wnw	16 15	ese	wsw
1		18.14	1	
2		20.10	2	
3		22.05	3	

Latitude 44 Degrees.

North Dec.		Dec.	South Dec.	
☉ ri	☉ ſet	d. m.	☉ ri	☉ ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		2.01	1	
2		4.03	2	
3		6.04	3	
e b n	w b n	8 04	e b s	w b s
1		10 04	1	
2		12.03	2	
3		14.01	3	
ene	wnw	15.59	e s e	w s w
1		17 54	1	
2		19.50	2	
3		21.42	3	
nebe	nwbw	23.34	sebe	swbw

Latitude 45 Degrees

North Dec.		Dec.	South Dec.	
☉ ri	☉ ſet	d. m.	☉ ri	☉ ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		2.00	1	
2		3.59	2	
3		5.57	3	
e b n	w b n	7.56	e b s	w b s
1		9.54	1	
2		11.51	2	
3		13.46	3	
ene	wnw	15.42	e s e	w s w
1		17.36	1	
2		19 28	2	
3		21.19	3	
nebe	nwbw	23.08	sebe	swbw

Latitude 46 Degrees.

North Dec.		Dec.	South Dec.	
☉ ri	☉ ſet	d. m.	☉ ri	☉ ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		1.58	1	
2		3.55	2	
3		5.51	3	
e b n	w b n	7.47	e b s	w b s
1		9.43	1	
2		11.38	2	
3		13.32	3	
ene	wnw	15.25	e s e	w s w
1		17.17	1	
2		19.07	2	
3		20.55	3	
nebe	nwbw	22.42	sebe	swbw

Latitude 47 Degrees.

North Dec.		Dec.	South Dec.	
☉ ri	☉ ſet	d. m.	☉ ri	☉ ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		1.55	1	
2		3.50	2	
3		5.45	3	
e b n	w b n	7.39	e b s	w b s
1		9.33	1	
2		11.25	2	
3		13.17	3	
ene	wnw	15 07	e s e	w s w
1		16.57	1	
2		18.45	2	
3		20.31	3	
nebe	nwbw	22.16	sebe	swbw

Latitude 48 Degrees.

North Dec.		Dec.	South Dec.	
⊙ri	⊙ſet	d. m.	⊙ri	⊙ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		1.53	1	
2		3.46	2	
3		5.38	3	
ebn	wbn	7.30	ebs	wbs
1		9.22	1	
2		11.12	2	
3		13.01	3	
ene	wnw	14.50	ese	wsw
1		16.38	1	
2		18.24	2	
3		20.07	3	
nebe	nwbw	21.49	sebe	swbw
1		23.29	1	

Latitude 49 Degrees.

North Dec.		Dec.	South Dec.	
⊙ri	⊙ſet	d. m.	⊙ri	⊙ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		1.51	1	
2		3.42	2	
3		5.31	3	
ebn	wbn	7.22	ebs	wbs
1		9.10	1	
2		10 59	2	
3		12.46	3	
ene	wnw	14.32	ese	wsw
1		16.17	1	
2		18.01	2	
3		19.42	3	
nebe	nwbw	21.22	sebe	swbw
1		23.01	1	

Latitude 50 Degrees.

North Dec.		Dec.	South Dec.	
⊙ri	⊙ſet	d. m.	⊙ri	⊙ſet
Eaſt	Weſt	0 00	Eaſt	Weſt
1		1 48	1	
2		3.37	2	
3		5 25	3	
ebn	wbn	7.12	ebs	wbs
1		8.59	1	
2		10 46	2	
3		12.30	3	
ene	wnw	14.14	ese	wsw
1		15.57	1	
2		17.39	2	
3		19.18	3	
nebe	nwbw	20.55	sebe	swbw
1		22.31	1	

Latitude 51 Degrees.

North Dec.		Dec.	South Dec.	
⊙ri	⊙ſet	d. m,	⊙ri	⊙ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		1.46	1	
2		3.33	2	
3		5.18	3	
ebn	wbn	7.04	ebs	wbs
1		8.48	1	
2		10.32	2	
3		12.14	3	
ene	wnw	13.56	ese	wsw
1		15.36	1	
2		17.16	2	
3		18.52	3	
nebe	nwbw	20.28	sebe	swbw
1		22.01	1	
2		23.32	2	

Latitude 44 Degrees.

North Dec.		Dec.	South Dec.	
⊙ ri	⊙ ſet	d. m.	⊙ ri	⊙ ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		2.01	1	
2		4.03	2	
3		6.04	3	
e b n	w b n	8 04	e b s	w b s
1		10 04	1	
2		12.03	2	
3		14.01	3	
e n e	w n w	15.59	e s e	w s w
1		17 54	1	
2		19.50	2	
3		21.42	3	
nebe	nwbw	23.34	sebe	swbw

Latitude 45 Degrees

North Dec.		Dec.	South Dec.	
⊙ ri	⊙ ſet	d. m.	⊙ ri	⊙ ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		2.00	1	
2		3.59	2	
3		5.57	3	
e b n	w b n	7.56	e b s	w b s
1		9.54	1	
2		11.51	2	
3		13.46	3	
e n e	w n w	15.42	e s e	w s w
1		17.36	1	
2		19 28	2	
3		21.19	3	
nebe	nwbw	23.08	sebe	swbw

Latitude 46 Degrees.

North Dec.		Dec.	South Dec.	
⊙ ri	⊙ ſet	d. m.	⊙ ri	⊙ ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		1.58	1	
2		3.55	2	
3		5.51	3	
e b n	w b n	7.47	e b s	w b s
1		9.43	1	
2		11.38	2	
3		13.32	3	
e n e	w n w	15.25	e s e	w s w
1		17.17	1	
2		19.07	2	
3		20.55	3	
nebe	nwbw	22.42	sebe	swbw

Latitude 47 Degrees.

North Dec.		Dec.	South Dec.	
⊙ ri	⊙ ſet	d. m.	⊙ ri	⊙ ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		1.55	1	
2		3.50	2	
3		5.45	3	
e b n	w b n	7.39	e b s	w b s
1		9.33	1	
2		11.25	2	
3		13.17	3	
e n e	w n w	15 07	e s e	w s w
1		16.57	1	
2		18.45	2	
3		20.31	3	
nebe	nwbw	22.16	sebe	swbw

Latitude 48 Degrees.

North Dec.	Dec.	South Dec.
⊙ri | ⊙ſet	d. m.	⊙ri | ⊙ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	1.53	1
2	3.46	2
3	5.38	3
ebn wbn	7.30	ebs wbs
1	9.22	1
2	11.12	2
3	13.01	3
ene wnw	14.50	ese wsw
1	16.38	1
2	18.24	2
3	20.07	3
nebe nwbw	21.49	sebe swbw
1	23.29	1

Latitude 49 Degrees.

North Dec.	Dec.	South Dec.
⊙ri | ⊙ſet	d. m.	⊙ri | ⊙ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	1.51	1
2	3.42	2
3	5.31	3
ebn wbn	7.22	ebs wbs
1	9.10	1
2	10 59	2
3	12.46	3
ene wnw	14.32	ese wsw
1	16.17	1
2	18.01	2
3	19.42	3
nebe nwbw	21.22	sebe swbw
1	23.01	1

Latitude 50 Degrees.

North Dec.	Dec.	South Dec.
⊙ri | ⊙ſet	d. m.	⊙ri | ⊙ſet
Eaſt Weſt	0 00	Eaſt Weſt
1	1 48	1
2	3.37	2
3	5.25	3
ebn wbn	7.12	ebs wbs
1	8.59	1
2	10 46	2
3	12.30	3
ene wnw	14.14	ese wsw
1	15.57	1
2	17.39	2
3	19.18	3
nebe nwbw	20.55	sebe swbw
1	22.31	1

Latitude 51 Degrees.

North Dec.	Dec.	South Dec.
⊙ri | ⊙ſet	d. m,	⊙ri | ⊙ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	1.46	1
2	3.33	2
3	5.18	3
ebn wbn	7.04	ebs wbs
1	8.48	1
2	10.32	2
3	12.14	3
ene wnw	13.56	ese wsw
1	15.36	1
2	17.16	2
3	18.52	3
nebe nwbw	20.28	sebe swbw
1	22.01	1
2	23.32	2

Latitude 52 Degrees.

North Dec.	Dec.	South Dec.
☉ ri | ☉ ſet	d. m.	☉ ri | ☉ ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	1.44	1
2	3.27	2
3	5.11	3
e b n w b n	6.54	e b s w b s
1	8 36	1
2	10.18	2
3	11.58	3
ene wnw	13.37	e s e w s w
1	15.16	1
2	16.52	2
3	18.27	3
nebe nwbw	20 00	sebe swbw
1	21.31	1
2	23.00	2

Latitude 53 Degrees.

North Dec.	Dec.	South Dec.
☉ ri | ☉ ſet	d. m.	☉ ri | ☉ ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	1.42	1
2	3.23	2
3	5.04	3
e b n w b n	6.44	e b s w b s
1	8.25	1
2	10 04	2
3	11.42	3
ene wnw	13.19	e s e w s w
1	14.55	1
2	16.29	2
3	18 01	3
nebe nwbw	19 32	sebe swbw
1	21.01	1
2	22.27	2

Latitude 54 Degrees.

North Dec.	Dec.	South Dec.
☉ ri | ☉ ſet	d. m.	☉ ri | ☉ ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	1.39	1
2	3.18	2
3	4.57	3
e b n w b n	6.35	e b s w b s
1	8.13	1
2	9.50	2
3	11 25	3
ene wnw	13.00	e s e w s w
1	14 33	1
2	16.05	2
3	17.35	3
nebe nwbw	19.05	sebe swbw
1	20.30	1
2	21.54	2
3	23.15	3

Latitude 47 Degrees.

North Dec.	Dec.	South Dec.
☉ ri | ☉ ſet	d. m.	☉ ri | ☉ ſet
Eaſt Weſt	0.00	Eaſt Weſt
1	1.37	1
2	3 13	2
3	4.49	3
e b n w b n	6.25	e b s w b s
1	8.01	1
2	9 35	2
3	11.08	3
ene wnw	12.41	e s e w s w
1	14.12	1
2	15 42	2
3	17 09	3
nebe nwbw	18 35	sebe swbw
1	19 59	1
2	21.21	2
3	22.30	3

Latitude 56 Degrees.

North Dec		Decl.	South Dec.	
☉ri	☉ſet	d. m.	☉ri	☉ ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		1.34	1	
2		3.09	2	
3		4.42	3	
ebn	wbn	6.16	ebs	wbs
1		7.49	1	
2		9.21	2	
3		10.51	3	
ene	wnw	12.22	ese	wsw
1		13.50	1	
2		15,18	2	
3		16.42	3	
nebe	nwbw	18.06	sebe	swbw
1		19.28	1	
2		20.47	2	
3		22.03	3	
ne	nw	23.18	se	sw

Latitude 57 Degrees.

North Dec.		Decl.	South Dec.	
☉ri	☉ſet	d. m.	☉ri	☉ſet
Eaſt	Weſt	0.00	Eaſt	Weſt
1		1.32	1	
2		3.04	2	
3		4.35	3	
ebn	wbn	6.06	ebs	wbs
1		7.36	1	
2		9.06	2	
3		10.34	3	
ene	wnw	12.01	ese	wsw
1		13.28	1	
2		14.53	2	
3		16.16	3	
nebe	nwbw	17.37	sebe	swbw
1		18.56	1	
2		20.13	2	
3		21.27	3	
ne	nw	22.39	se	sw

Latitude 58 Degrees.

Eaſt	Weſt	0,00	Eaſt	Weſt
1		1,30	1	
2		2,59	2	
3		4.28	3	
ebn	wbn	5.56	ebs	wbs
1		7.24	1	
2		8.51	2	
3		10.17	3	
ene	wnw	11.42	ese	wsw
1		13.06	1	
2		14.28	2	
3		15.48	3	
nebe	nwbw	17.07	sebe	swbw
1		18.24	1	
2		19.39	2	
3		20.51	3	
ne	nw	22.00	se	sw
1		23.08	1	

Latitude 59 Degrees.

Eaſt	Weſt	0.00	Eaſt	Weſt
1		1.27	1	
2		2.54	2	
3		4.20	3	
ebn	wbn	5.46	ebs	wbs
1		7.11	1	
2		8.36	2	
3		10.00	3	
ene	wnw	11.22	ese	wsw
1		12.44	1	
2		14.03	2	
3		15.21	3	
nebe	nwbw	16.37	sebe	swbw
1		17.52	1	
2		19.04	2	
3		20.14	3	
ne	nw	21.22	se	sw
1		22.26	1	
2		23.27	2	

Latitude 60 Degrees.

North Declination.			South Declination.		
⊙ riſe	D. M.	⊙ ſet	⊙ riſe	D. M.	⊙ ſet
Eaſt	0.00	Weſt	Eaſt	0.00	Weſt
1	1.25	1	1	1.25	1
2	2.49	2	2	2.49	2
3	4.12	3	3	4.12	3
e by n	5.36	w by n	e by s	5 36	w by s
1	6.59	1	1	6.59	1
2	8.21	2	2	8.21	2
3	9.42	3	3	9.42	3
e n e	11.02	w n w	e s e	11.02	w s w
1	12.21	1	1	12.21	1
2	13.38	2	2	13.38	2
3	14.53	3	3	14.53	3
n e by e	16.08	n w by w	s e by e	16.08	s w by w
1	17.20	1	1	17.20	1
2	18.30	2	2	18.30	2
3	19.38	3	3	19.38	3
n e	20.42	n w	s e	20.42	s w
1	21.45	1	1	21.45	1
2	22.44	2	2	22.44	2

The Deſcription and Uſe of the foregoing TABLES

1. THESE Tables of the Points of the Compaſ (for the Sun, or any Star whoſe Declination e ceeds not 23 deg. 29 min.) begin at Latitude 0 deg. a proceed orderly to 60 deg. (being ſome four, ſome tw Tables, in one Page) and ſixty-one in all.

2. In each Table are five Columns; the middlem contains the Degrees of Declination, either North South; thoſe two on each Side of it, mark'd ⊙ riſe, ſet (under *North* or *South Declination*) ſtand for Sun-riſi and Sun-ſetting.

3. The firſt and ſecond Columns (under *North Declination*) as alſo the fourth and fifth Columns under *South Declination*) contain the Points, and each Quarter of a Point of the Compaſs, of both Riſing and Setting: Thus, *Eaſt*, *Weſt*, under which is 1, 2, 3; that is *Eaſt* or *Weſt* 1 Quarter, 2 Quarters, 3 Quarters, *Northerly* or *Southerly*; then E. by N. W. by N. under which is 1, 2, 3; that is, E. by N. or W. by N. 1 Quarter, 2 Quarters *Northerly*, *&c.*

Theſe Tables are ready Helps for finding the Variation of the Compaſs with Eaſe and ſufficient Exactneſs; as is evident from the following Explanation.

To find the Point of the Compaſs that the Sun riſeth or ſetteth with, at any Time of the Year.

FIRST, ſeek the Sun's Declination, in the Table of Declination for the Time propoſed; with which enter the foregoing Table, finding the Latitude in the Head of the Table, and the Declination in the third Column; againſt which, on the Left-hand, if it be North Declination, but on the Right-hand if it be South Declination, is the Point of the Compaſs that the Sun iſes or ſets at, according to the Titles at the Head of the Table.

Note, Theſe Tables ſhew the true Points of the Sun's Riſing or Setting; ſo that you may readily know at any Time, ſeeing the Sun riſe or ſet, the Variation by an ordinary Meridian Compaſs.

There are ſome Compaſſes not touched ſo well as they ught to be; others in Time will grow weak, or loſe their agnetic Virtue.

Now by theſe foregoing Tables you may very readily iſcover any of theſe Defects.

It may indeed be objected, they cannot ſee the Sun by an rdinary Meridian Compaſs, ſo near as is required.

To this I anſwer, it's as eaſy to ſet the Sun by the Compaſs, as to ſteer a Ship by it ; for expert Seamen can ſet the Sun, or a Headland, to near a Quarter of a Point by their Hand, (but with Sights much nearer the Truth.) The Poſture to obſerve in ſuch a Caſe, I adviſe, is thus ;

Set the Compaſs about two Feet high, and directing your Hand towards the Sun, note what Point, Half-point, or Quarter-point, the Sun riſeth, or ſetteth on ; then in that Table belonging to the Latitude, ſee whether the Sun riſeth or ſets that Day upon the ſame Point, found by Obſervation ; if they agree, there is no Variation ; but if they do not agree, the Compaſs is not true, or theree is Variation ; and the Variation is ſo much, as is the Difference between the Obſervation and the Table.

Example 1. Admit in Latitude 30 Degrees North, the Sun having 9 Degrees 43 Minutes North Declination ; I obſerve the Sun that Day to riſe upon the E.N.E. Point of the Compaſs. I demand the Variation ?

In the Head of the foregoing Tables, look for the Latitude 30 Degrees ; and in the third Column for 9 deg. 43 min. North Declination ; and againſt it (under ☉ riſe) is E. by N. which ſheweth that there is one Point Variation. For it appears by the Table, that the E.N.E. Point on the Compaſs is the true E. by N. Point ; and the E. by N. (as it's upon the Compaſs) is the true E. Point ; the Eaſt Point is the true E. by S. the S.E. is the S.E. by S. and the South is the S. by W. the Weſt is the W. by N. and the North is the N. by E.

This plainly appears by the *Rectifier*, if you bring th E. by N. on the outward Circle, right againſt the E.N.E on the inward Circle.

Now ſuppoſe we were to obſerve the Sun at his Setting, in the Latitude of 30 deg. with Declination 9 deg 43 min. North as aboveſaid, we ſhould find the Sun t ſet exactly at Weſt by the Compaſs, although in th Mornin

Morning we did find the Sun to riſe at E.N.E. I know this will be little leſs than a Contradiction to ſome; but if you caſt your Eye upon the *Rectifier*, you may ſee it's a certain Truth.

Example 2. In Latitude 37 deg. North, the Sun's Declination 8 deg. 58 min. North, I obſerve the Sun to riſe E. by N. by the Compaſs: I demand the Variation?

In the Table that belongs to 37 deg. againſt 8 deg. 58 min. North Declination, and under ☉ Riſe is E. by N. which ſheweth there is no Variation, becauſe the Obſervation agreeth with the Table.

Note, If the Declination for the Day propoſed be not the ſame with the Declination in the Tables, then have Regard to the neareſt, allowing for the Difference, by the Rule of Proportion.

Example 3. In the Latitude 37 deg. North, ſuppoſe the Sun's Declination 10 deg 15 min. North, I demand the Point of the Compaſs the Sun then riſeth upon?

In the Tables neareſt to 10 deg. 15 min. is 11 deg. 12 min. againſt which the Sun riſeth E. by N. a quarter N. and ſets W. by N. a quarter N. but in the Table for 37 deg. Latitude, the Declination propoſed, is near about the middle, between 8 deg. 58 min. and 11 deg. 12 min. Therefore the Sun riſeth E. by N. half a quarter N. and ſetteth W. by N. half a quarter N.

Underſtand the like in any other Caſe, let the Declination be what it will, and in any other Latitude.

Example 4. Admit in Latitude 38d. 20m. North, and Declination 19d. 50m. South: The Sun riſeth upon the E.S.E. Point of the Compaſs: I demand the Variation?

In the Table for Latitude 38 deg. and againſt 19 deg. 41 min. (the neareſt to the given Declination) is E.S.E. a quarter S. which ſheweth that there is a quarter of a Point Variation. For the E.S.E. Point is E.S.E. a quarter S. and the North Point is N. a quarter E. For, if you bring ESE. a quarter S. on the outward Circle of the *Rectifier* right againſt E.S.E. on the inward Circle, then SSW. on the

Compaſs is SSW. a quarter W. and SE. is SE. a quarter S. and E. is E. a quarter S. And ſo for any other Point, Half-point, or Quarter-point, by caſting your Eye upon the *Rectifier*.

Note, Theſe Tables ſhew the true Points of Riſing and Setting, and the outward Circle on the *Rectifier* doth the ſame; but the Compaſs, when it differeth from the Tables, ſhews a falſe Point; and the inward Circle on the *Rectifier* doth the ſame.

Example 5. Admit in Latitude 47d. 24m. North, the Declination 15d. 2m. South, the Sun-riſing E. by S. by the Compaſs; I demand the Variation?

By the Tables the Sun ſhould riſe E S.E. therefore there is one Point Variation: For if you bring the E.S.E. on the outward Circle of the *Rectifier*, over againſt the E. by S. on the inward Circle, then the N. by W. on the Compaſs is the true North Point; the N.W. is the N.W. by N. and the S. by E. is the true South Point.

By this Time I ſuppoſe my Reader able to diſcover how much the Variation is, and how to reckon it without any Geometric Demonſtration, or Arithmetic Calculation.

Note, If you have any odd Minutes of Latitude, go to that Table neareſt the Latitude you are in.

I come now to reſolve a Queſtion which ſome are puzzled with; and that is this:

Queſt. If the Sun riſe at E.N.E. by any Compaſs in any Latitude, ſhould not he ſet the ſame Day at W.N.W. by the ſame Compaſs, and in the ſame Latitude?

Anſw. If there be no Variation he will; but if there be Variation, he will not. The Reaſon is evident by the *Rectifier*.

By theſe Tables you may know upon what Point of the Compaſs any of the Stars riſe and ſet in any Latitude the Tables contain, either North or South, if the Declination do not exceed the Sun's greateſt Declination.

Example 6. Let it be required to find the Points of the Compaſs the *Bull's Eye* riſes and ſets with, in the Latitude of 50 deg. North.

The Declination of this Star is 16 deg. North; in the Table that belongs to 50d. againſt 16 deg. North Declination, the true Point of Riſing is E.N.E. a quarter N. and the true Point of Setting W.N.W. a quarter N.

Underſtand the like for any other Star, whoſe Declination doth not exceed the Sun's greateſt Declination.

The Uſe of the RECTIFIER.

THIS Inſtrument, as before deſcribed, (in Pages 93, 94, and 95,) containeth two Circles or Compaſſes, one within the other; but as 'tis made of Wood, the one moves upon the other, and by it the Compaſs, when it varies may be rectified as follows:

Bring the true Point of Riſing or Setting (as the Table ſheweth) on the outward or under Compaſs, right againſt the falſe Point of Riſing and Setting (as your Compaſs ſheweth) on the inward or upper Compaſs; then will the under Compaſs rectify the upper.

Example 7. Admit in Lat. 45d. N. the Sun's Declination being 7d. 56m. South, the Sun ſetting upon the W. by N. Point of the Compas, I demand the Variation?

The Sun, if there be no Variation, will ſet at W. by S. and riſe at E. by S. as appears from the Table; therefore it is plain that there are two Points Variation.

Bring the W. by S. Point on the outward Compaſs, right againſt the W. by N. Point on the inward Compaſs; then the Points upon the outward Compaſs explain the Points that are upon the inward; ſo that according to the foregoing Obſervation, the N.N.E. Point on the Compaſs is the true North: The North is the true N.N.W. the W. by N. is the true W. by S. the S.E. by E. is the true E. by S. And ſo for any other Point of the Compaſs, by only looking on the *Rectifier*.

And thus you may rectify the Compaſs, without reckoning which way the Variation is, either Eaſtward or Weſtward: The *Rectifier* doing it ſo plain, that you can't be miſtaken.

A TABLE *of Amplitudes, fitting all Places from the Equator, to* 60 *Degrees of Latitude, either North or South.*

Degrees of Declination.

	The Degrees of Latitude.											
Sun's Declin.	1		2		3		4		5		6	
	D	M	D	M	D	M	D	M	D	M	D	M
0	00	00	00	00	00	00	00	00	00	00	00	00
1	01	00	01	00	01	00	01	00	01	00	01	00
2	02	00	02	00	02	00	02	00	02	00	02	00
3	03	00	03	00	03	00	03	00	03	00	03	01
4	04	00	04	00	04	00	04	00	04	01	04	01
5	05	00	05	00	05	00	05	00	05	01	05	01
6	06	00	06	00	06	00	06	01	06	01	06	02
7	07	00	07	00	07	00	07	01	07	01	07	02
8	08	00	08	00	08	01	08	01	08	02	08	02
9	09	00	09	00	09	01	09	01	09	02	09	02
10	10	00	10	00	10	01	10	01	10	02	10	03
11	11	00	11	00	11	01	11	01	11	02	11	03
12	12	00	12	00	12	01	12	01	12	03	12	04
13	13	00	13	00	13	01	13	01	13	03	13	04
14	13	00	14	00	14	01	14	02	14	03	14	04
15	15	00	15	00	15	01	15	02	15	03	15	05
16	16	00	16	01	16	01	16	02	16	04	16	05
17	17	00	17	01	17	01	17	02	17	04	17	05
18	18	00	18	01	18	01	18	02	18	04	18	06
19	19	00	19	01	19	01	19	02	19	04	19	06
20	20	00	20	01	20	02	20	03	20	05	20	06
21	21	00	21	01	21	02	21	03	21	05	21	07
22	22	00	22	01	22	02	22	03	22	05	22	07
23	23	00	23	01	23	02	23	03	23	05	23	08
23,29	23	22	23	30	23	31	23	33	23	35	23	37

A TABLE *of Amplitudes, fitting all Places from the Equator, to* 60 *Degrees of Latitude either North or South.*

The Degrees of Latitude.

Sun's Declin. Degrees of Declination.	7		8		9		10		11		12	
	D.	M.	D.	.	D.	M.	D.	M.	D.	M.	D.	M.
0	00	00	00	00	00	00	00	00	00	00	00	00
1	01	00	01	00	01	00	01	01	01	01	01	01
2	02	01	02	01	02	01	02	02	02	02	02	03
3	03	01	03	01	03	01	03	03	03	03	03	04
4	04	02	04	02	04	02	04	04	04	04	04	05
5	05	02	05	02	05	03	05	05	05	05	05	07
6	06	02	06	03	06	04	06	06	06	06	06	08
7	07	03	07	04	07	05	07	07	07	08	07	09
8	08	03	08	04	08	06	08	08	08	09	08	11
9	09	04	09	05	09	06	09	09	09	10	09	12
10	10	04	10	06	10	07	10	10	10	11	10	13
11	11	05	11	06	11	08	11	11	11	13	11	15
12	12	05	12	07	12	09	12	12	12	14	12	16
13	13	06	13	08	13	09	13	13	13	15	13	17
14	14	06	14	08	14	10	14	14	14	16	14	19
15	15	07	15	09	15	11	15	15	15	17	15	20
16	16	07	16	10	16	12	16	16	16	19	16	22
17	17	08	17	10	17	13	17	17	17	20	17	23
18	18	08	18	11	18	14	18	18	18	21	18	25
19	19	09	19	12	19	15	19	19	19	22	19	26
20	20	09	20	12	20	16	20	20	20	24	20	28
21	21	10	21	13	21	17	21	21	21	25	21	29
22	22	10	22	13	22	18	22	22	22	27	02	31
23	23	11	23	14	23	19	23	23	23	28	23	33
23,29	23	40	23	45	23	50	23	54	23	59	24	05

A TABLE *of Amplitudes, fitting all Places from the Equator, to* 60 *Degrees of Latitude, either North or South.*

Degrees of Declination.

Sun's Declin.	The Degrees of Latitude.											
	13		14		15		16		17		18	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
0	00	00	00	00	00	00	00	00	00	00	00	00
1	01	02	01	02	01	02	01	02	01	02	01	03
2	02	03	02	04	02	04	02	05	02	05	02	06
3	03	05	03	05	03	06	03	07	03	08	03	09
4	04	06	04	07	04	08	04	10	04	11	04	12
5	05	08	05	09	05	10	05	12	05	13	05	15
6	06	10	06	11	06	13	06	15	06	17	06	19
7	07	11	07	13	07	15	07	17	07	19	07	22
8	08	13	08	15	08	17	08	19	08	22	08	25
9	09	14	09	17	09	19	09	21	09	25	09	28
10	10	16	10	19	10	21	10	24	10	28	10	31
11	11	17	11	20	11	23	11	27	11	30	11	34
12	12	19	12	22	12	25	12	29	12	33	12	38
13	13	20	13	24	13	27	13	32	13	36	13	41
14	14	22	14	26	14	30	14	34	14	39	14	44
15	15	24	15	28	15	32	15	37	15	42	15	47
16	16	26	16	30	16	35	16	40	16	45	16	51
17	17	28	17	32	17	37	17	42	17	48	17	54
18	18	30	18	34	18	39	18	45	18	51	18	58
19	19	31	19	36	19	42	19	48	19	54	20	01
20	20	33	20	38	20	44	20	51	20	57	21	04
21	21	35	21	40	21	46	21	53	22	00	22	08
22	22	37	22	43	22	49	22	56	23	04	23	12
23	23	39	23	45	23	51	23	58	24	06	24	15
23 29	24	11	24	16	24	24	24	32	24	40	24	49

A TABLE *of Amplitudes, fitting all Places from the Equator, to* 60 *Degrees of Latitude, either North or South.*

The Degrees of Latitude.

Degrees of Declination.

Sun's Declin.	19		20		21		22		23		24	
	D.	M.	D.	M.	D.	M	D.	M.	D.	M.	D.	M.
0	00	00	00	00	00	00	00	00	00	00	00	00
1	01	03	01	04	01	04	01	05	01	05	01	06
2	02	07	02	08	02	08	02	09	02	10	02	12
3	03	10	03	12	03	13	03	14	03	15	03	37
4	04	14	04	16	04	17	04	19	04	21	04	23
5	05	17	05	19	05	21	05	23	05	26	05	28
6	06	21	06	23	06	26	06	28	06	31	06	34
7	07	24	07	27	07	30	07	33	07	37	07	40
8	08	28	08	31	08	34	08	38	08	42	08	46
9	09	31	09	35	09	39	09	43	09	47	09	51
10	10	35	10	39	10	43	10	48	10	52	10	57
11	11	38	11	43	11	48	11	53	11	58	12	03
12	12	42	12	47	12	52	12	58	13	03	13	09
13	13	46	13	51	13	57	14	03	14	09	14	15
14	14	50	14	55	15	01	15	08	15	14	15	21
15	15	53	16	00	16	06	16	13	16	20	16	27
16	16	57	17	04	17	11	17	18	17	26	17	34
17	18	01	18	08	18	15	18	23	18	31	18	40
18	19	05	19	12	19	20	19	28	19	37	19	46
19	20	08	20	16	20	24	20	33	20	42	20	52
20	21	12	21	20	21	29	21	39	21	49	21	59
21	22	16	22	25	22	34	22	44	22	55	23	07
22	23	20	23	29	23	39	23	50	24	01	24	12
23	24	24	24	54	24	44	24	55	25	07	25	19
23,29	24	58	25	08	25	18	25	29	25	41	25	54

A TABLE *of Amplitudes, fitting all Places from the Equator, to* 60 *Degrees of Latitude, either North or South.*

Sun's Declin. Degrees of Declination.	The Degrees of Latitude.											
	25		26		27		28		29		30	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
0	00	00	00	00	00	00	00	00	00	00	00	00
1	01	06	01	07	01	08	01	03	01	09	01	09
2	02	12	02	13	02	15	02	16	02	17	02	18
3	03	18	03	20	03	22	03	24	03	26	03	28
4	04	25	04	27	04	29	04	32	04	34	04	37
5	05	31	05	33	05	37	05	40	05	43	05	46
6	06	37	06	41	06	44	06	48	06	52	06	56
7	07	43	07	48	07	51	07	56	08	01	08	06
8	08	50	08	54	08	59	09	04	09	09	09	15
9	09	56	10	01	10	06	10	12	10	18	10	24
10	11	03	11	08	11	14	11	21	11	27	11	34
11	12	09	12	15	12	21	12	28	12	36	12	44
12	13	16	13	23	13	30	13	37	13	45	13	53
13	14	22	14	30	14	37	14	45	14	54	15	03
14	15	29	15	37	15	45	15	54	16	03	16	12
15	16	35	16	44	16	53	17	03	17	12	17	23
16	17	42	17	51	18	01	18	11	18	21	18	32
17	18	49	18	59	19	09	19	20	19	31	19	43
18	19	56	20	06	20	17	20	29	20	41	20	54
19	21	02	21	13	21	25	21	38	21	51	22	05
20	22	10	22	22	22	34	22	48	23	02	23	16
21	23	18	23	30	23	43	23	57	24	12	24	27
22	24	24	24	37	24	51	25	06	25	22	25	38
23	25	32	25	46	26	01	26	16	26	32	26	49
23,29	26	08	26	23	26	37	26	52	27	08	27	25

A TABLE *of Amplitudes, fitting all Places from the Equator, to* 60 *Degrees of Latitude, either North or South.*

The Degrees of Latitude.

Sun's Declin.	31		32		33		34		35		36	
	D	M	D	M	D	M	D	M	D	M	D	M
0	00	00	00	00	00	00	00	00	00	00	00	00
1	01	10	01	10	01	11	01	12	01	13	01	14
2	03	19	02	21	02	23	02	25	02	27	02	29
3	03	30	03	33	03	35	03	38	03	40	03	43
4	04	40	04	43	04	46	04	50	04	53	04	57
5	05	50	05	54	05	58	06	02	06	06	06	11
6	07	00	07	05	07	10	07	15	07	20	07	25
7	08	11	08	16	08	21	08	27	08	33	08	40
8	09	21	09	27	09	33	09	39	09	46	09	54
9	10	31	10	38	10	45	10	52	11	00	11	08
10	11	41	11	48	11	55	12	05	12	12	12	21
11	12	52	13	00	13	09	13	18	13	28	13	39
12	14	02	14	11	14	21	14	32	14	43	14	54
13	15	13	15	23	15	33	15	44	15	56	16	09
14	16	22	16	33	16	45	16	57	17	10	17	24
15	17	34	17	46	17	58	18	11	18	25	18	40
16	18	44	18	57	19	11	19	25	19	40	19	55
17	19	56	20	10	20	24	20	39	20	55	21	11
18	21	07	21	21	21	36	21	55	22	10	22	27
19	22	19	22	34	22	50	23	07	23	25	23	44
20	23	31	23	47	24	04	24	22	24	41	25	00
21	24	43	25	00	25	18	25	37	25	56	26	17
22	25	55	26	13	26	32	26	52	27	13	27	35
23	27	07	27	26	27	46	28	07	28	29	28	52
23,29	27	43	28	03	28	23	28	45	29	05	29	22

Degrees of Declination.

A TABLE *of Amplitudes, fitting all Places from the Equator, to* 60 *Degrees of Latitude either North or South.*

The Degrees of Latitude.

Sun's Declin. Degrees of Declination.	37		38		39		40		41		42	
	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
0	00	00	00	00	00	00	00	00	00	00	00	00
1	01	15	01	16	01	17	01	18	01	20	01	21
2	02	30	02	32	02	34	02	36	02	39	02	41
3	03	45	03	48	03	51	03	54	03	58	04	02
4	05	00	05	04	05	08	05	13	05	18	05	23
5	06	16	06	21	06	26	06	32	06	38	06	44
6	07	31	07	37	07	43	07	50	07	57	08	05
7	08	47	08	54	09	01	09	09	09	17	09	26
8	10	02	10	10	10	19	10	28	10	37	10	47
9	11	17	11	27	11	37	11	47	11	58	12	09
10	12	32	12	43	12	54	13	06	13	18	13	31
11	13	00	14	01	14	13	14	26	14	39	14	53
12	15	06	15	18	15	31	15	45	16	00	16	15
13	16	22	16	35	16	49	17	04	17	20	17	37
14	17	38	17	52	18	08	18	24	18	42	19	00
15	18	55	19	11	19	28	19	45	20	04	20	23
16	20	11	20	28	20	46	21	05	21	25	21	46
17	21	28	21	46	22	06	22	26	22	48	23	10
18	22	48	23	05	23	25	23	47	24	10	24	34
19	24	04	24	24	24	46	25	09	25	33	25	58
20	25	21	25	43	26	06	26	30	26	56	27	24
21	26	39	27	02	27	27	27	53	28	21	28	50
22	27	58	28	23	28	49	29	16	29	45	30	16
23	29	17	29	43	30	11	30	40	31	11	31	43
23,29	29	58	30	24	30	52	31	22	31	54	32	28

A TABLE *of Amplitudes, fitting all Places from the Equator, to* 60 *Degrees of Latitude, either North or South.*

Sun's Declin.	The Degrees of Latitude.											
	43		44		45		46		47		48	
Degrees of Declination.	D	M	D	M	D	M	D	M	D	M	D	M
0	00	00	00	00	00	00	00	00	00	00	00	00
1	01	22	01	23	01	25	01	26	01	28	01	29
2	02	44	02	47	02	50	02	53	02	56	02	59
3	04	06	04	10	04	15	04	19	04	24	04	29
4	05	28	05	34	05	40	05	46	05	52	05	59
5	06	51	06	58	07	05	07	12	07	20	07	29
6	08	13	08	21	08	30	08	39	08	49	08	59
7	09	35	09	45	09	56	10	06	10	18	10	30
8	10	58	11	09	11	21	11	34	11	47	12	00
9	12	21	12	34	12	47	13	01	13	16	13	31
10	13	44	13	58	14	13	14	28	14	44	15	02
11	15	07	15	22	15	38	15	56	16	15	16	34
12	16	31	16	48	17	06	17	25	17	45	18	06
13	17	55	18	13	18	33	18	54	19	16	19	39
14	19	18	19	39	20	00	20	23	20	47	21	12
15	20	43	21	05	21	28	21	52	22	18	22	45
16	22	08	22	32	22	56	23	23	23	50	24	20
17	23	34	23	59	24	25	24	53	25	23	25	55
18	24	59	25	26	25	54	26	25	26	57	27	31
19	26	25	26	54	27	25	27	58	28	32	29	07
20	27	53	28	23	28	56	29	31	30	07	30	45
21	29	20	29	53	30	27	31	03	31	42	32	23
22	30	48	31	22	31	58	32	37	33	18	34	03
23	32	16	32	51	33	30	34	12	34	56	35	43
23 29	33	03	33	40	34	20	35	03	35	48	36	35

A TABLE *of Amplitudes, fitting all Places from the Equator, to* 60 *Degrees of Latitude either North or South.*

	The Degrees of Latitude.											
Sun's Declin.	49		50		51		52		53		54	
Degrees of Declination.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.	D.	M.
0	00	00	00	00	00	00	00	00	00	00	00	00
1	01	31	01	33	01	35	01	37	01	39	01	42
2	03	03	03	06	03	10	03	15	03	20	03	24
3	04	34	04	40	04	46	04	52	04	59	05	06
4	06	06	06	14	06	22	06	30	06	39	06	49
5	07	38	07	48	07	58	08	08	08	19	08	31
6	09	42	09	21	09	33	09	46	10	00	10	15
7	10	14	10	55	11	09	11	24	11	40	11	57
8	12	47	12	29	12	45	13	02	13	21	13	41
9	13	00	14	05	14	24	14	43	15	04	15	26
10	15	21	15	40	16	01	16	23	16	46	17	11
11	16	54	17	16	17	39	18	03	18	29	18	57
12	18	28	18	52	19	18	19	44	20	12	20	43
13	20	03	20	29	20	57	21	26	21	57	22	30
14	21	38	22	06	22	37	23	08	23	42	24	18
15	23	14	23	45	24	18	24	52	25	28	26	07
16	24	51	25	24	25	59	26	36	27	16	27	58
17	26	28	27	03	27	41	28	21	29	04	29	50
18	28	06	28	43	29	24	30	07	30	53	31	42
19	29	45	30	25	31	08	31	55	32	45	33	38
20	31	25	32	08	32	54	33	44	34	39	35	35
21	33	06	33	52	34	41	35	34	36	31	37	32
22	34	48	35	37	36	30	37	27	38	29	39	26
23	36	33	37	26	38	23	39	24	40	29	41	40
23,29	37	26	38	20	39	19	40	23	41	29	42	46

A TABLE *of Amplitudes, fitting all Places from the Equater, to* 60 *Degrees of Latitude, either North or South.*

The Degrees of Latitude.

Sun's Decin.	55		56		57		58		59		60	
	D	M	D	M	D	M	D	M	D	M	D	M
0	00	00	00	00	00	00	00	00	00	00	00	00
1	01	45	01	47	01	50	01	53	01	56	02	00
2	03	29	03	34	03	40	03	46	03	53	04	00
3	05	14	05	22	05	31	05	40	05	50	06	00
4	06	59	07	10	07	22	07	34	07	47	08	01
5	08	44	08	57	09	11	09	26	09	43	10	02
6	10	30	10	47	11	04	11	22	11	42	12	04
7	12	15	12	35	12	56	13	18	13	41	14	06
8	14	02	14	24	14	48	15	14	15	41	16	10
9	15	49	16	14	16	45	17	10	17	41	18	14
10	17	37	18	05	18	33	19	07	19	41	20	18
11	19	26	19	56	20	29	21	04	21	43	22	26
12	21	15	21	49	22	25	23	04	23	47	24	34
13	23	05	23	43	24	23	25	07	25	54	26	44
14	24	56	25	37	26	21	27	09	28	01	28	55
15	26	49	27	34	28	22	29	14	30	12	31	09
16	28	43	29	32	30	24	31	21	32	22	33	27
17	30	39	31	31	32	27	33	28	34	32	35	47
18	32	35	33	33	34	34	35	40	36	53	38	09
19	34	35	35	36	36	46	37	54	39	13	40	36
20	36	36	37	42	38	53	40	12	41	37	43	10
21	38	39	39	51	41	09	42	34	44	05	45	48
22	40	47	42	04	43	27	44	59	46	40	48	32
23	42	56	44	19	45	50	47	30	49	21	51	23
23,29	44	00	45	27	47	02	48	46	50	42	52	51

Degrees of Declinatiou.

The Uſe of theſe Tables of Amplitudes.

THE Sun or Star's Amplitude, is the Diſtance of the Riſing or Setting of the Sun or Star from the Eaſt or Weſt Points of the Horizon, in Degrees and Minutes, reckoned in the Horizon; either Northerly or Southerly.

Note, When the Sun or Star's have North Declination they riſe to the Northward of the Eaſt, and ſet to the Northward of the Weſt; But if their Declination be South, they riſe to the Southward of the Eaſt, and ſet to the Southward of the Weſt: And by theſe Tables the Aplitude is thus found, *viz.*

Look the Latitude in the Head of the Tables, the Declination in the firſt Column on the Left-hand; and in the common Angle of Meeting is the Amplitude required.

Example 1. In the Latitude of 30 deg, the Sun's Declination being 7d. 0m. North, I demand the Amplitude?

Anſw. The Amplitude is 8 deg. 6 min. For under Lotitude 30d. in Page 140, and againſt Declination 7d. you will find 8d. 6m. which is the Amplitude from the Eaſt Northward at Sun-riſing, and from the Weſt Northward at Sun-ſetting. But if the Declination had been 7d. 0m. South, in Latitude 30d. as aforeſaid, then the Amplitude would have been 8d. 6m. from the Eaſt Southward at Sun-riſing, and 8d. 6m. from the Weſt Southward at Sun-ſetting.

If there be any odd Minutes of Declination, take the Proportional Parts.

Example 2. In the Latitude of 42m. 30m. the Sun's Declination being 12d. 15m. I demand the Amplitude?

Anſw. The Ampl. is 16d. 43m. found as follows: According to the former Directions, for the Lat. of 42d.

$$\text{and Declin. being}\left\{\begin{matrix}12\\13\end{matrix}\right\}\text{d. the Ampl. is}\left\{\begin{matrix}\text{16d. 15m.}\\\text{17d. 37m.}\end{matrix}\right.$$

Subtract, and their Difference is ———— 1d. 22m.

Then ſay, as 1d. or 60m. is to 1d. 22m. or 82m. ſo is 15m. to 20m. found as hereunder:

If 60m. give —— 82m. what ſhall 15 min?
15
——
410
82
————
6|0)123|0(20m. Proportional Parts.
————
030 Remainder.

Lat. 42d. and Declin. 12d. the Amplit is 16d. : 15m.
To it add the Proportional Parts above —— 00d. : 20m.
Gives Amplitude for Declin. 12d. 15m. to be 16d. : 35m.

Again, for Lat. 43d. and Declin. —— { 12 / 13 } deg. Ampl. — is —— { 16d. : 31m. / 17d. : 55m.
Subtracted, makes the Difference to be —— 1d. : 24m.

Then ſay, As 60m. is to 1d. 24m. or 84m. ſo is 15m. to 21m. found as hereunder;

If 60m. give —— 84 min. what ſhall 15m?
15
——
420
84
————
6|0)126|0(21 min. Proportional Parts.
06
————
00 Remainder.

	D.	M.
Lat. 43d. and Declin. 12d. Amplitude is ——	16	31
To it add the Proportional Parts above ——	00	21
Gives for Declination 12d. 15m. the Amplitude	16	52

Now becauſe the given Latitude 42d. 30m. is in the middle, between 42d. and 43d. therefore the Medium of the Amplitude before found, is the Amplitude required, and is thus:

Lat. $\left\{\begin{matrix}42\\43\end{matrix}\right\}$ d. Decl. 12d. 15m. the Ampl. is $\left\{\begin{matrix}16d. : 35m.\\16d. : 52m.\end{matrix}\right.$

Added together, is - - - - - - - - - - - - - - 33d. : 27m.

The half is the Amplitude required - - - - 16d. : 43m.

Thus may the Amplitude be found for any odd Minutes of Latitude or Declination, though the Table is calculted for whole Degrees only.

By this Table the Variation of the Compaſs is moſt readily found; for by the Azimuth or Amplitude Compaſs find the Sun or Star's Magnetic Amplitude, at their Riſing or Setting; and their true Amplitude (according to the Latitude of the Place, and their Declination, by this Table; the Difference of theſe Amplitudes (when both are North or both South) but their Sum (if one North the other South) is the Variation of the Compaſs.

But by the *Rectifier* it is moſt eaſily done thus:

Bring the Magnetic Amplitude (on the upper or innermoſt Compaſs) right againſt the true Amplitude (on the lower or outermoſt Compaſs) then doth the North Point in the upper, ſtand againſt the Variation in the lower; and the upper Compaſs is explained in all its Parts by the lower Compaſs.

Example 1. Suppoſe the Magnetic Amplitude at Sunriſing (found by the Azimuth or Amplitude Compaſs) be Eaſt Southerly 15d. 30m. and the true Amplitude (according to the Latitude of the Place, and Declination of the Object obſerved) be Eaſt Southerly 26d. 45m. I demand the Variation of the Compaſs?

By the *Rectifier*.

Bring 15d. 30m. Eaſt Southerly on the upper Compaſs againſt 26d. 45m. Eaſt Southerly, on the lower Compaſs. Then doth the North Point on the firſt ſtand right againſt 11d. 15m. North Eaſterly on the latter: ſo that the Compaſs doth vary 11d. 15m. or 1 Point Eaſt.

Ex

Ex. 2.	True	Ampl.	07d. 00m.	Eaſt Northerly.
	Magn.		15d. 30m.	Eaſt Southerly.

I demand the Variation of the Compaſs?

By the Rectifier.

Bring 15d. 30m. Eaſt Southerly on the upper Compaſs, right againſt 7 deg. Eaſt Northerly, on the lower Compaſs, then the North Point on the firſt ſtands againſt 22 deg. 30 min. on the laſt, North Weſterly, that is two Points Weſt Variation. In like manner for any other; and thus the Variation is moſt readily found. This *RECTIFIER* is made of Wood.

* * *

The APPENDIX contains the Deſcription and Uſe of INSTRUMENTS moſt uſeful in *Navigation*.

* * *

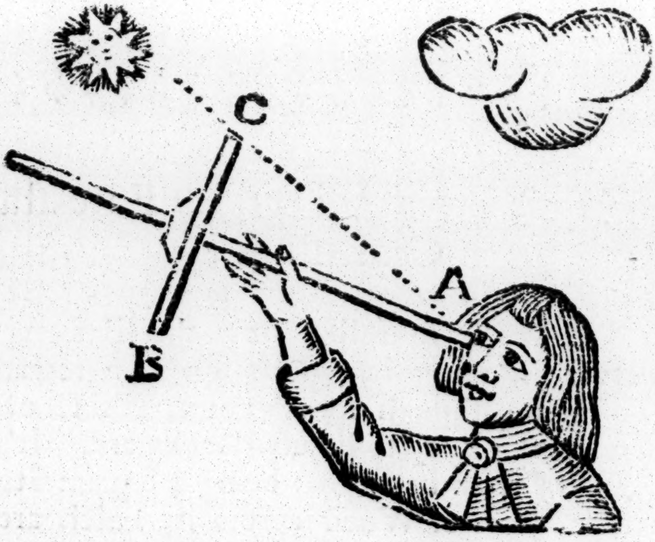
The Deſoription and Uſe of the Fore-ſtaff, *or* Croſs-ſtaff.

THE *Fore-ſtraff*, ſo called from the Poſture of the Obſerver in uſing it, whoſe Face is towards the Object obſerved; though for the Sun, it's ſo contrived (for preſerving the Eye) to be uſed backward. It's called alſo a *Croſs-ſtaff* from its Form: being a Square Staff with three or four Pieces of Wood acroſs it, which are called Croſſes, or Vanes.

The Staff is uſually about 30 Inches, or 3 Feet long, and more than half an Inch ſquare, having four Sides, each graduated unequally, like a Scale of Tangents. To each of them belongs a diſtinct Croſs; though ſometimes the ſhorten Croſs is made to ſerve two Sides of the Staff; that is, the Breadth is for the Ten-Croſs, and the Length for the Thirty-Croſs. Beſides this, it hath two Croſſes more, the longeſt is the Ninety-Croſs, the other is the Sixty-Croſs. Theſe four Croſſes are thus to be underſtood, *viz.*

10	Croſs belongs to that Side beginning at	4	and ending at	10
30		10		30
60		20		60
90		30		90

The Figure of the *Fore-ſtaff.*



The Uſe of the Fore-ſtaff.

IT's common and ordinary at Sea, to take the Meridian Altitude of the Sun or Star with this Inſtrument, and by it to find the Latitude the Ship is in.

To perform which, obſerve theſe Precepts following.

1. *Note*, The 10, 30, 60, and 90 Croſs, are to be uſed according as the Meridian Altitude is more or leſs; that is, if leſs than 10d. uſe the 10 Croſs; if between 10 and 30d. uſe the 30 Croſs; if between 30 and 60d. the 60 Croſs; if more than 60, uſe the 90 Croſs.

2. Having conſidered which Croſs (according to the judg'd Altitude of the Object intended to be obſerved) is ſuitable, put it on the Staff, ſo that the flat Side of the Croſs may be towards the flat or ſquare end of the Staff; Then,

3. Hold the flat End of the Staff (as at A) to the Corner of your Eye; there let it reſt upon your Eye-bone, as near the Corner of your Eye as you can, ſo it doth not hinder your Sight.

4. Then look to the upper End of the Croſs (as at C) for the Sun or Star, and at the lower End (at B) for the Horizon.

5. But if at the lower End of the Croſs, you ſee all Sky and no Water, then draw the Croſs a little nearer to your Eye.

6. If, on the contrary, you ſee all Water and no Sky, then ſlide the Croſs a little farther from you.

7. Then, if you ſee the Center of the Sun or Star at the upper End of the Croſs, and the Horizon at the lower End, the Croſs ſtands as it ought.

8. Wait till the Sun or Star be on the Meridian, making Obſervations often; and as the Sun or Star riſeth, draw the Croſs a little nearer to your Eye.

9. If the Sun or Star be fallen, you will not ſee the Horizon, for the Water will hide it from you, and then Obſerving is over at that Time. Stir not the Croſs out of its Place, only ſee at what deg. &c. it reſteth on that Side

of the Staff belonging to it; and the Degrees and Minutes cut by the Edge of the Croſs, is the Meridian Altitude or Complement thereof according to the Word *Alt.* or *Comp.* on the Staff.

How to Uſe the Fore-ſtaff *backward.*

THIS is only uſed with the Sun, and for this Purpoſe the Ten-Croſs hath another Piece of Wood or Ivory put croſs it; ſo that the lower Edge of this Croſs Piece lieth even with the middle of the Square Hole in the Ten-Croſs, which alſo anſwers to the middle of the Thickneſs of the Staff.

There is alſo a Plate of Braſs with a Hole in it, and ſo fitted, that it will ſlide on and fit the Ends of the 90, 60, or 30 Croſs: Theſe two Things added to the Fore-ſtaff makes it fit for a backward Obſervation of the Sun, which is thus, *viz.*

1. According as the Meridian Altitude of the Sun, is more or leſs, ſo uſe the 90, 60, or 30 Croſs; putting it on the Staff, the flat Side of it exactly even with the flat End of the Staff, there ſcrew it faſt; and at one End of the Croſs ſlip on the foreſaid Braſs Plate ſo as to leave a ſlit Sight thro' it, near the lower End of the Croſs.

2. Put the Ten-Croſs (having a Croſs-piece on it as aforeſaid) on the Staff, the flat Side of it towards the other Croſs at the Staff's End.

3. Turn your Back to the Sun, look through the Slit in the Braſs, at the lower End of the Croſs, for the Shadow at the upper End of it, lying on the Ten-Croſs in the Line anſwering the middle of the Staff, and on each Side of the Staff.

4. At the ſame Time the Horizon ſhould be ſeen (thro' the foreſaid Slit) to lie even with the ſhadow on the middle Line, in the Ten-Croſs; and at each End of it, on both Sides the Croſs.

5. In looking through the Slit in the Braſs, you muſt bring the Shadow upon the middle Line, and if inſtead of the Horizon you only ſee the Water there, then draw the

Ten-Croſs nearer, till the Shadow and Horizon agree or meet in the ſaid middle Line.

6. On the contrary, looking as before, if inſtead of the Horizon you ſee Sky meet the Shadow on the middle Line; then put the Ten-Croſs from you, (till you ſee the Horizon and the Shadow meet together) on the middle Line.

7. Continue obſerving till the Sun be at the higheſt; and as the Sun riſeth, you muſt draw the Ten-Croſs nearer in order to keep the Horizon and Shadow together on the ſaid middle of it.

8. If the Sun be fallen (after you have continued obſerving as before directed) the Horizon will lie below the Shadow on the middle Line; then is the obſerving finiſhed at that Time: Stir not the Ten-Croſs out of its Place, for where it now ſtands (on that Side of the Staff belonging to the Croſs at the End of it) is the Sun's Meridian Altitude, or Complement thereof, as before in obſerving forward.

Thus I have ſhewed how to take an Obſervation by the Croſs-ſtaff both forward and backward. The next Thing in Order, will be to ſhew how to work it; and for that Purpoſe take Notice of theſe following Rules.

To work an Obſervation.

1. IF the Sun or Star hath North Declination, and be on the Meridian to the Southward of you, ſubtract the Declination from the Meridian Altitude; the Remainder is the Height of the Equinoctial or Complement of the Latitude Noth.

2. But if the Object obſerved hath South Declination, and be to the Southward of your Zenith, add; the Sum (if it exceed not 90 deg.) is the Height of the Equator, or Complement of the Latitude North: If the Sum exceeds 90 deg. ſubtract 90 from it; the Remainder is the Latitude South.

3. If the Object hath North Declination, and be on the Meridian to the Northward, add the Declination

to the Meridian Altitude; the Sum (if it exceed not 90d. is the Height of the Equator, or Complement of the Latitude, South: But if it doth not exceed 90 deg. ſubtract 90d. from the ſaid Sum, the Remainder is the Latitude, North.

4. If the Sun hath South Declination, and be to the Northward at Noon, ſubtract the Declination from this Meridian Altitude; the Remainder is the Complement of the Latitude, South.

5. When the Sun hath no Declination, the Meridian Altitude is the Complement of the Latitude North, if he be South at Noon; and the contrary.

6. If the Sun be in the Zenith, and at the ſame time he hath no Declination, you are then under the Equinoctial.

7. But if the Sun hath North or South Declination, and in the Zenith, the Declination is the Latitude you are in, North or South.

8. If you obſerve the Sun or any Star upon the Meridian beneath the Pole, add the Meridian Altitude to the Complement of the Sun or Star's Declination; the Sum is the Height of the Pole, or Latitude of the Place.

Theſe eight Rules are explained by the Examples following.

Examples for working an Obſervation in North Latitude.

Example 1. ADMIT at Sea, I obſerve the Sun's Meridian Altitude to be 42d. 20m. South, and at the ſame time the Sun's Declination is 10d. 10m. North, I demand the Latitude I am in?

	D.	M,	
The Meridian Altitude - - - - - - - - -	42	: 20	South
The Sun's Declination - - - - ſubtract	10	: 10	North
The Complement of the Latitude - - -	32	: 10	
Subtract it from - - - - - - - - - - - - - - -	90	: 00	
The Latitude I am in, is - - - - - - - -	57	: 50	North

Example 2. Being at Sea the 22d of *May*, *Anno* 1763, I find the Sun's Meridian Altitude to be 65 deg. 10 min. South; I demand the Latitude?

		D.	M.	
The Meridian Altitude - - - - - - - - - -		65	10	South
The Sun's Declination - - - -	ſubtract	20	24	North
The Complement of the Latitude - - -		44	46	
Subtract it from - - - - - - - - - - - - - -		90	00	
The Latitude I am in, is - - - - - - - - -		45	14	North

Example 3. Being at Sea the 27th of *November*, *Anno* 1765. I find the Sun's Meridian Altitude to be 26 deg. 30 min. South; I demand the Latitude I am in?

		D.	M.	
The Meridian Altitude - - - - - - - - - -		26	30	South
The Sun's Declination - - - - - - -	add	21	16	South
The Complement of the Latitude - - -		47	46	
Subtract it from - - - - - - - - - - - - - - -		90	00	
The Latitude I am in, is - - - - - - - - -		42	14	North

Example 4. At Sea, the 25th of *April*, *Anno* 1766, I find the Sun's Meridian Altitude, by Obſervation, to be 58d. 45m. South; I demand the Latitude I am in?

	D.	M.	
Meridian Altitude - - - - - - - - - - - - -	58	45	South
The Declination - - - - - - - - - - - - - - - -	13	17	North
The Complement of the Latitude - - -	45	28	
Subtract it from - - - - - - - - - - - - - - -	90	00	
The Latitude I am in, is - - - - - - - - -	44	32	North

Example 5. Admit the 12th Day of *June*, 1763, I find the Sun's Meridian Altitude, by Obſervation, to the 80 deg. 35 min. North; I demand the Latitude I am in?

The

D. M.
Meridian Altitude - - - - - - - - - - - - - - 80 : 35 North
Sun's Declination - - - - - - - - - - - add 23 : 11 North

The Sum is - - - - - - - - - - - - - - - - 103 : 46
From it ſubtract - - - - - - - - - - - - - - 90 : 00

The Latitude I am in, is - - - - - - - - 13 : 46 North

Example 6. Admit *Auguſt* 22, 1771, the Sun's Meridian Altitude was obſerved to be 85d. 15m North ; I demand the Latitude of that Place ?

D. M.
The Meridian Altitude - - - - - - - - - 85 : 15 North
Sun's Declination - - - - - - - - - - - add 11 : 51 North

The Sum is - - - - - - - - - - - - - - - - 97 : 06
From it ſubtract - - - - - - - - - - - - - - 90 : 00

The Latitude of the Place is - - - - - - 07 : 06 North

Example 7. Admit in a Ship at Sea, *June* 19, 1772, the Sun's Meridian Altitude is 66d. 46m. North ; I demand the Latitude the Ship is in ?

D. M.
The Meridional Altitude - - - - - - - - 66 : 46 North
The Sun's Declination - - - - - - - add 23 : 29 North

Complement of the Latitude - - - - - - 90 : 15
From it ſubtract - - - - - - - - - - - - - - 90 : 00

The Ship is almoſt under the Equinoctial 00 : 15 North

Example to find the Latitude, *by obſerving the Stars.*

Examp. 8. ADMIT I obſerve the *Bull's Eye* upon the Meridian, and find his Meridian Altitude to be 50d. 30m. South ; I demand the Latitude I am in ?

The

	D.	M.	
The Declination of the *Bull's Eye* is - -	16	00	North
The Meridian Altitude of the Star - -	50	30	South
The Star's Declination - - - - ſubtract	16	00	North
Complement of Latitude is - - - - - - -	34	30	
Subtract it from - - - - - - - - - - - - -	90	00	
The Latitude I am in, is - - - - - - - -	55	30	North

Example 9. Admit, I obſerve the bright Star in the *Great Dog's Mouth*, and I find his Meridian Altitude to be 35d. 45m. South; I demand the Latitude I am in?

	D.	M.	
The Declin. of the *Great Dog's Mouth* is	16	24	South
The Meridian Altitude of the Star - - -	35	45	South
The Star's Declination - - - - - - - add	16	24	South
The Height of the Equator is - - - - - -	52	09	
Subtract it from - - - - - - - - - - - - -	90	00	
The Latitude I am in, is - - - - - - - -	37	51	North

Example for working an Obſervation in South Lrtitude.

Examp. 10. ADMIT the 10th Day of *May*, *Anno* 1770, I find the Sun's Meridian Altitude, by Obſervation to be 62d. 00m. North; I demand the Latitude the Ship is in;

	D.	M.	
The Meridian Altitude - - - - - - - - - -	62	00	North
The Sun's Declination - - - - - - - add	17	41	North
The Complement of the Latitude is - -	79	41	
Subtract it from - - - - - - - - - - - - - -	90	00	
The Latitude the Ship is in, is - - - - -	10	19	South

Example 11. Admit the 15th Day of *January*, *Anno* 1764, in Longitude 150d. Eaſt, I find the Meridian Altitude by Obſervation to be 38d. 45m. North? I demand the Latitude the Ship is in?

The Sun's Declination in the Meridian of *London* for the 15th of *January* is 21d. 11m. the daily difference at this Time is 11m. decreaſing; therefore (in the Table of Proportion) in Page 20, you will find the Proportional Minutes to be 5m. which add to the Declination in the Meridian of *London*, the Sum is 21d. 16m. South, the Sun's true Declination for the Longitude of 150d. Eaſt.

		D.	M.	
The Meridian Altitude - - - - - - - - - -		38	45	North
The Sun's Declination - - - -	ſubtract	21	16	South
Complement of the Latitude, is - - - -		17	29	
Subtract it from - - - - - - - - - - - - - -		90	00	
The Latitude the Ship is in, is - - - -		72	31	South

Example 12. Admit the 12th Day of *July*, *Anno* 1767, I find the Sun's Meridian Altitude to be 66 deg. 52 min. North, I demand the Latitude?

		D.	M.	
The Meridian Altitude - - - - - - - - - -		66	52	North
The Sun's Declination - - - - - -	add	22	02	North
Complement of the Latitude, is - - - -		88	54	
Subtract it from - - - - - - - - - - - - - - -		90	00	
Latitude required, is - - - - - - - - - - -		01	06	South

Example 13. A Ship at Sea, the Sun's Declination being 15d. 30m. South, and the Sun's Meridian Altitude 80d. 45m. South, I demand the Latitude the Ship is in?

Anſw. The Latitude is 6d. 15m. South.

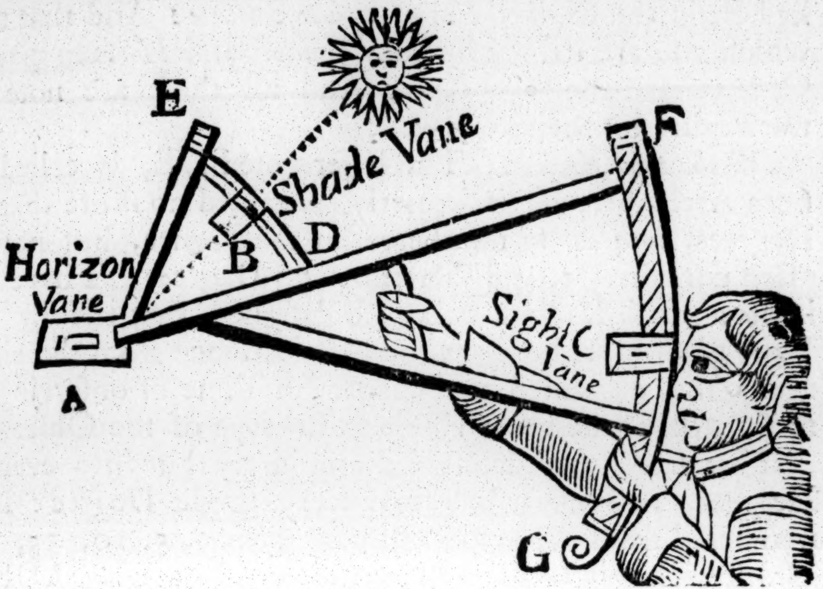
Example 14. The Sun's Declination being 11d. 14m. South, and his Meridian Altitude 79d. 38m. South; I demand the Latitude?

Anſw. The Latitude is 0d. 52m. South.

Note 1. If you obſerve by the lower Part, Edge, or Limb of the Sun, you muſt add to the Altitude taken, 16m. for the Sun's Semidiameter, and the Sum will be the true Altitude of the Sun's Center.

Note 2. If you obſerve by the upper Limb of the Sun, ſubtract 16m. the Remainder is the Altitude of the Sun's Center.

The Figure of the QUADRANT.



The Deſcription and Uſe of the QUADRANT.

THIS Inſtrument (called a Quadrant, firſt invented by our Countryman Capt. *Davis*, and thence called *Davis's Quadrant*) is of a very commodious Form; at preſent the moſt general approved Inſtrument at Sea (at this time *Hadley's* particularly excepted) for obſerving the Sun's Meridian Altitude.

The Form of it (as in the Figure prefixed) may be of any Radius or Length, between 18 Inches and 3 Feet; but the moſt general now made, are Quadrants of 24 Inches Radius, with one Arch 65 Degrees, the other 25 Degrees, with a Glaſs Vane and a Shadow Vane.

The Principal Parts are three Vanes and two Arches; on which Arches the Degrees taken together make 90d. from whence it hath the Denomination of a Quadrant.

The *Horizon Vane* (mark'd in the foregoing Figure A, and with it's Name) reſpects the Horizon in Time of obſerving: That which gives the Shadow or lucid Spot marked B, in the *Shadow Vane*, or *Glaſs Vane*: And that thro' which you are to look for both *Shadow* and *Horizon* marked C, is termed the *Sight Vane*: And all theſe are noted in the Figure by their Names.

Of the two Arches. The leſſer noted DE, is called the 60th Arch, becauſe it formerly contained no more than 60 Degrees, and is ſo numbered in the Figure, but now it often contains 65, and ſometimes 70 Degrees: This Arch is of a ſmall Radius, being ſo deſigned that the Shadow Vane uſed on it, being at ſo ſmall Diſtance from the Horizon Vane, on which its Shadow (in Time of obſerving) is to fall, might be more viſible to the Eye of the Obſerver.

This *Little Arch* is divided ſometimes but into every 5 Degrees, and never leſs than every ſingle Degree: It is numbered from the upper End E, with 0, 5, 10, 15, 20, *&c.* downwards to D, where it ends in the Line ADF (a Line in the middle of the longer Leg of the Quadrant) at 60, 65, or 70 Degrees, according as the other Arch is divided; ſo that the Numbers at D and F together, muſt always make 90 Degrees.

The *Greater Arch*, GF, is called the 30th Arch: It's of a large Radius, that it might contain the leſſer Diviſions of a Degree; and being of a competent Breadth, thereon are uſually deſcribed 9 Concentric Circles, interſected with three Diagonal Lines, (ſometimes ſix) in each Degree, making each Interſection two Minutes of a Degree, and ſometimes one.

The *Great Arch* is divided on the Limb into Degrees by long Strokes; each again ſubdivided into ſix equal Parts by ſhorter Strokes; each ſmall Diviſion being 10 Minutes, and are numbered from the lower End G, with 5, 10, 15, *&c.* upwards to F, where it Ends in the Line ADF, either at 20, 25, or 30 Degrees: The Figures always at F and D together makes 90 Degrees as aforeſaid.

The Uſe of the QUADRANT.

THIS Inſtrument is rarely uſed otherwiſe than to obſerve the Sun's Meridian Altitude; which to perform, I thus deſcribe.

1. Put the Horizon Vane A on the End, and cloſe to the Center; the Sight Vane put on the Arch GF, cloſe to the Back of it; and the Shadow Vane or Glaſs Vane put on the little Arch DE, cloſe to the Back of it, and fix the upper Edge of the Shadow Vane, to a Number of Degrees (on the Side of the 60 Arch) leſs than the Complement of the Altitude by 15 or 20 Degrees.

2. The Vanes being thus fixed upon the Quadrant, turning your Back to the Sun, the End G in your Hand, and F uppermoſt, look through the Sight Vane, cauſing the upper Edge of the Shade of the Shadow Vane, or lucid Spot from the Glaſs Vane, to lie upon the upper Edge of the Slit in the Horizon Vane, where is drawn a black Line; at the ſame Time, if the Horizon appear through the ſaid Slit in the Horizon Vane, the Vanes on the Quadrant ſtand at the Sun's preſent Altitude.

3. But if the Sky appear inſtead of the Horizon, ſlide the Sight Vane a little higher towards F; on the contrary, if the Sea appear inſtead of the Horizon, then ſlide the Sight Vane lower towards G; continue ſo to do till the Horizon appear through the Horizon Vane.

4. In order to obtain the Meridian Altitude (which is the greateſt Altitude the Sun will have that Day, and the Thing uſed to find the Latitude) continue obſerving; and as the Sun riſes, the Sea will appear thro' the Horizon Vane; and the Sight Vane muſt be ſlid lower accordingly; Thus continue obſerving as often as may be convenient, till the Sun is at the higheſt.

5. When the Sun begins to fall, the Sky will appear through the Horizon Vane, inſtead of the Horizon; then deſiſt obſerving for that Day.

6. Having thus done, add the Degrees the upper Edge of the Shade Vane ſtandeth at, to the Degrees and Min. cut by the Inſide of the Sight Vane, their Sum is the Com-

plement of the Sun's Meridian Altitude, or the Diſtance on the upper Edge of the Sun from the Zenith; to which Sum add 16m. the Sun's Semidiameter, and the laſt Sum is the Diſtance of the Sun's Center from the Zenith, being the true Complement of the Sun's Meridian Altitude.

Note; The upper Edge of the Shade of the Shadow Vane reſpects the upper Limb of the Sun, and the lower Edge of the ſaid Vane anſwers to the lower Limb of the Sun; ſo that obſerving by the firſt, you are to add 16 Minutes; on the contrary, obſerving by the latter, ſubtract 16 Minutes, to, or from what's on the Quadrant, the Sum or Difference is the Diſtance of the Sun's Center from the Zenith, called his Zenith Diſtance, or Complement of his Meridian Altitude.

Thus I have ſhewed how to take an Obſervation with the Quadrant: I come now to ſhew how to work it. The Difference in working an Obſervation taken by the Fore-ſtaff and Quadrant, is only this: By the Fore-ſtaff you take the Altitude by the Quadrant the Complement of the Altitude, or the Diſtance of the Sun from the Zenith.

Altitude is the Diſtance of the Sun from the Horizon; therefore if you ſubtract the Complement of the Altitude from 90d. the Remainder is the Altitude; which you may uſe as in the Uſe of the Fore-ſtaff, in Pages 153 and 154.

But it's uſual to work Obſervations (made by the Quadrant) by the Complement of the Sun's Meridian Altitude; I will therefore give ſome general Rules, and ſome particular Examples for their Explanation.

The General Rules are,

1. IF the Sun hath North Declination, and upon the Meridian to the Southward of the Obſerver, add the Sun's Declination to the Zenith Diſtance, (or Complement of the Sun's Meridian Altitude) the Sum is the Latitude you are in, North.

2. If the Sun be to the Southward of you, and hath South Declination, ſubtract the Sun's Declination from

the Zenith Diſtance, the Remainder will be the Latitude you are in, North: But if the Declination exceed the Zenith Diſtance, ſubtract the leſs from the greater, and the Remainder is the Latitude, South.

3. If the Sun be to the Northward of you, and hath South Declination, add the Sun's Declination to his Zenith Diſtance, the Sum will be the Latitude, South.

4. If the Sun be to the Northward of you, and hath North Declination, ſubtract the Sun's Declination from his Zenith Diſtance, the Remainder will be the Latitude, South; but if the Declination exceed the Zenith Diſtance, ſubtract the leſs from the greater, and it gives the Latitude, North.

I might have given more general Rules; but if you underſtand thoſe eight Rules for the Uſe of the Fore-ſtaff, you cannot err in theſe, in uſing the Quadrant: And for their Explanation, ſee the Examples following.

Working an Obſervatin in North Latitude.

Example 1. ON the 10th of *April*, 1763, the Sun comes to the Meridian in the South, and by Obſervation, found his Zenith Diſtance, or Complement of his Meridian Altitude, to be 34d. 47m. that is, his upper Limb was ſo much from the Zenith: I demand the Latitude of the Place of Obſervation?

		D.	M.	
Compl. of the Sun's Meridian Altitude —		34	47	South
The Sun's Semidiameter — ——	add	00	16	
Diiſtance of the Sun'sCenter ſtom Zenith		35	03	South
Declination —— — —— ——	add	07	57	North
Latitude of the Place required, is ——		43	00	North

Example 2. The 14th Day of *Auguſt*, *Anno* 1763, I find the Complement of the Sun's Meridian Altitude, by Obſervation, to be 28d. 48m. South; I demand the Latitude the Ship is in?

	D.	M.	
Comp. of the Sun's Meridian Altitude —	28 :	48	South
Sun's Semidiameter - - - - - - - - - - add	00 :	16	
Diſtance of the Sun's Center from Zenith	29 :	04	South
The Sun's Declination - - - - - - - add	14 :	26	North
The Latitude the Ship is in, is - - - -	43 :	30	North

Example 3. *October* 3, 1763, I find the Complement of the Sun's Meridian Altitude, by Obſervation, to be 47d. 35m. South; I demand the Latitude I am in?

	D.	M.	
Comp. of the Sun's Meridian Altitude - -	47 :	35	South
Sun's Semidiameter - - - - - - - - - add	00 :	16	
Diſtance of the Sun's Center from Zenith	47 :	51	South
The Sun's Declination - - - - ſubtract	03 :	57	South
The Latitude the Ship is in, is - - - -	43	54	North

Examplt 4. The fifth Day of *November*, *Anno* 1763. I find the Complement of the Sun's Meridian Altitude, by Obſervation, to be 52d. 00m. South; I demand the Latitude the Ship is in?

	D.	M.	
Comp. of the Sun's Meridian Altitude -	52 :	00	South
Sun's Semidiameter - - - - - - - - - add	00 :	16	
Diſtance of the Sun's Center fromZenith	52 :	16	South
The Declination of the Sun - - ſubtract	15 :	43	South
Latitude the Ship is in, is - - - - - - - -	36 :	33	North

Example 5. The 27th of *May*, 1767, the Sun to the Northward of me, and the Complement of his Meridian Altitude by Obſervation is 10d. 15m. I demand the Latude the Ship is in?

	D.	M.	
Sun's Declination - - - - - - - - - - - - - -	21 :	19	North
Complement of Sun's Meridian Altitude	10 :	15	North
The Sun's Semidiametrer - - - - - add	00 :	16	
The Sun's true Zenith Diſtance, ſubtract	10 :	31	North
Latitude the Ship is in, is - - - - - - - -	10 :	48	North

Example 6. Admit the 29th Day of *June*, *Anno* 1763, the Sun upon the Meridian, I find, by Obſervation, the upper Limb of the Sun is 6d. 42m. to the Northward of my Zenith; I demand the Latitude I am in?

	D.	M.	
Sun's Declination - - - - - - - - - - - - -	23 :	17	North
Sun's upper Marg. Diſtance from Zen. -	06 :	42	North
Sun's Semidiameter - - - - - - - - - add	00 :	16	
Diſt. of the Sun's Center from Zenith ſub.	06 :	58	North
Latitude the Ship is in, is - - - - - - - -	16 :	19	North

Example 7. The 21ſt of *July*, *Anno* 1763, in Longitude 165 deg. Weſt, and the Sun being upon the Meridian, I find by Obſervation, the upper Margin of the Sun is 16d. 45m. to the Northward of my Zenith; I demand the Latitude the Ship is in?

	D.	M.	
The Sun's Declination at *London*. - - -	20 :	32	North
Proportional Min. for Longitude ſubtract	00 :	05	
Sun's Declination in the Meridian given	20 :	27	North
Sun's Supreme Marg. Diſt. from Zenith -	16 :	45	North
Sun's Semidiameter - - - - - - - - - add	00 :	16	
Sun's Central Diſt. from the Zenith ſubt.	17 :	01	North
Latitude the Ship is in, is - - - - - - -	03 :	26	North

Working an Obſervation in South Latitude.

Example 8. THE 14th Day of *July*, *Anno* 1763, in Longitude 120 deg. Eaſt, the Sun being upon the Meridian, I find the Complement of his Meridian Altitude, by Obſervation, to be 48d. 28m. North: I demand the Latitude the Ship is in?

	D.		M.	
Comp. of the Sun's Meridian Altitude —	48	:	28	North
Sun's Semidiameter —— —— add	00	:	16	
Sun's Central Diſtance from the Zenith —	48	:	44	North
Sun's Declination for the Longit. ſubtract	21	:	47	North
The Latitude the Ship is in, is ——	26	:	57	South

Example 9. The 25th of *October*, *Anno* 1766, in Longitude 120 deg. Weſt, and the Complement of the Sun's Meridian Altitude, by Obſervation, is 27d. 29m. North; I demand the Latitude the Ship is in?

	D.		M,	
Comp. of the Sun's Meridian Altitude —	27	:	29	North
Sun's Semidiameter —— —— add	00	:	16	
Sun's Central Diſtance from the Zenith —	27	:	45	North
The Declination of the Sun's Prop. —add	12	:	19	South
The Latitude the Ship is in, is —— —	40	:	04	South

Example 10. Admit the 24th of *December*, *Anno* 1766. I find the Sun upon the South Part of the Meridian, and by Obſervation the Complement of the Sun's Meridian Altitude 15d. 10m. I demand the Latitude the Ship is in?

	D.		M.	
Compl. of the Sun's Meridian Altitude —	15	:	10	South
Sun's Semidiameter —— —— add	00	:	16	
Sun's Central Diſt. from the Zenith ſubtract	15	:	26	South
The Declination of the Sun —— ——	23	:	27	South
Latitude the Ship is in, is —— ——	08	:	01	South

Thus much I thought neceſſary to add by way of Explanation upon the foregoing Rules, in Page 162, which exhibit and explain a more perfect and accurate Method, both in taking and working an Obſervation, than hath been formerly made uſe of.

Note 1. The Sun's Semidiameter here added to the Complement of its Meridian Altitude, may be placed on the Quadrant, ſo that its Addition by the Pen may be omitted; For this Purpoſe the Quadrants have on the back Edge of the little Arch (every 5 Degrees numbered, differing from thoſe on the flat Side) the Semidiameter of the Sun: So that placing the upper Edge of the Shadow Vane, to the Degree on the ſaid back Edge of the Arch, the Quadrant then ſheweth the true Complement of the Altitude, or the Diſtance of the Sun's Center from the Zenith; which prevents adding 16 Minutes after obſerving.

Note 2. There is another Contrivance now made uſe of, which is, by fixing a Convex Glaſs in ſuch Manner in the Shade Vane, that the Diameter of the Glaſs may exactly range with the upper Edge of the ſaid Vane, and which Glaſs will then, in Time of Obſervation, caſt an illuminated Spot on a round black Spot made in the Horizon Vane: This is uſeful when the Edge of the Shadow reflected from the Shade Vane is not very conſpicuous, the Spot being diſcernable when the latter is not: The Manner is thus:

Set that Part of the Glaſs Vane, which is right againſt the Middle or Center of the Glaſs, to the Degrees on the Side of the little Arch, and then cauſe the enlighted Spot of the Glaſs to lie on the black Spot or Circle on the Horizon Vane; at the ſame Time look for the Horizon thro' it, as before directed, in Page 160; ſo you will have (obſerving by this Glaſs in the Vane) the true Complement of the Sun's Altitude, or the Diſtance of his Center from the Zenith.

The Deſcription and Uſe of the NOCTURNAL.

1. THE *Nocturnal* conſiſts of three Parts; the firſt termed the unmoveable Part, is the broadeſt and greateſt; on which is a Handle to hold it by, in Time of Obſervation, or uſing it.

On the Fore-ſide of which, in the outermoſt Circle, are the twelve Months, and each Month ſubdivided into its reſpective Days; they are counted towards the Left-hand, from the Tip, or nearly ſo, when you hold it erect by the Handle, and marked with their Names, or the firſt Letters thereof; as *Jan.* for *January*, *Feb.* for *February*, *Mar.* for *March*, &c. Within the Circle of the Months is a Circle divided into 24 equal Parts or Hours, each Hour divided into Halves and Quarters; uſed to find the Time of Full Sea or High-water.

On the Back-ſide of this Part, are the 32 Points of the *Mariner's Compaſs*, South uppermoſt, and Eaſt on the Left-hand: To each Point is ſet the Delination of the North Star, above or under the Pole; which is known by *Und.* for *Under*, *Abo.* for *Above*.

Formerly there was made two Sorts of Nocturnals, one for the Great Bear, the other for the Little Bear: Thoſe made for the Guards of the Great Bear, or *Charles's Wane*, commonly called the two Pointers, have *February* at the Top; but thoſe made for the Guards of the Little Bear, have *April* at the Top: But they are now made for both Bears in one Nocturnal, and are known by having either two Circles or Months, marked GB and LB; or two ſhort Teeth or Indices, proceeding from the ſecond or middle Part of it, marked GB and LB; ſignifying Great Bear, or Little Bear.

2. The ſecond moveable middle Part hath two Circles on it; the outermoſt is divided into the 29 Days and a half of the Moons Age; the innermoſt is divided into 24 equal Parts or Hours, each Hour ſubdivided into Halves and Quarters; this Part hath a Tooth, or ſhort Index proceeding from it, with the Edge continued in a Right-line from the Center, which is to be ſet to the Day of the Month when uſed: Some have two Indices, marked G on one, and L on the other; G ſtanding for Great Bear, and L for Little Bear; ſignifying the Nocturnal is made for both Bears; and may be uſed for either.

3. The third and moveable Part is called the Index; it is uppermoſt on the Fore-ſide of the Inſtrument, having one Edge proceeding in a Right-line from the Center, (which in Time of Obſervation) muſt be turned to the Guards: Through all three Pieces, in the Center of the Inſtrument, is a Hole, through which you are to ſee the North Star, when the Index is turned to the Guards.

The Uſe of the NOCTURNAL.

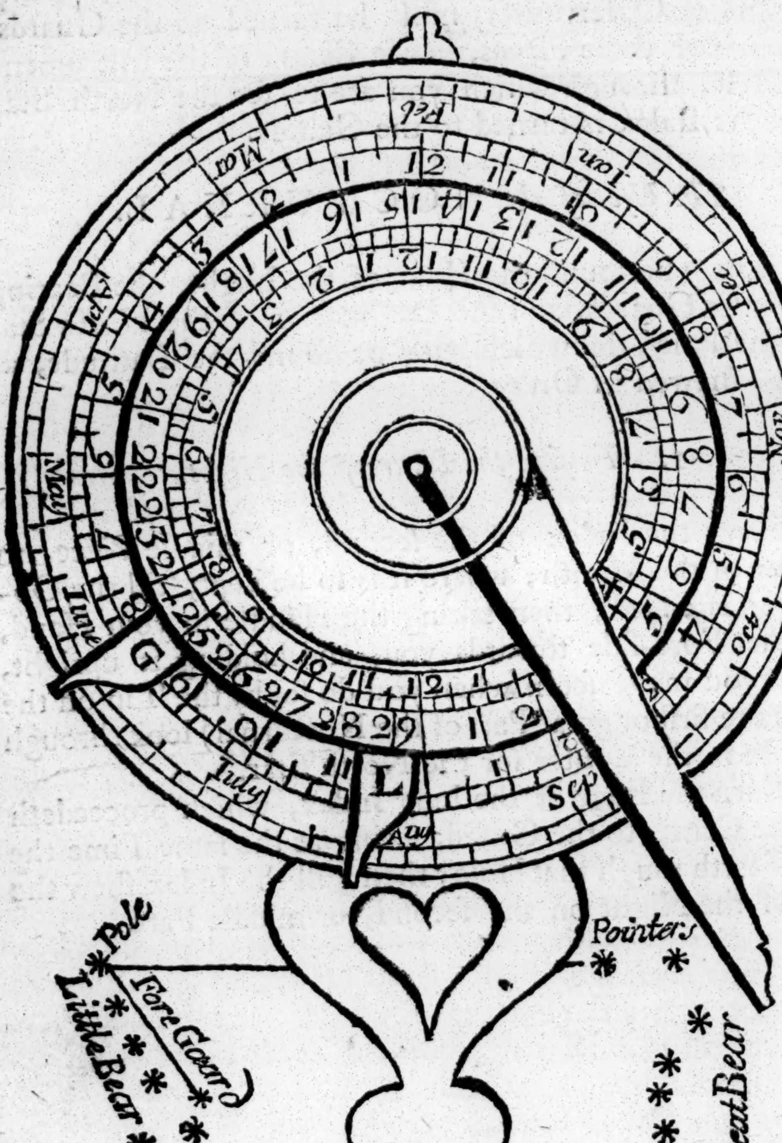
BY it may be found the Hour of the Night, the Bearing of the Guards, and the Declination of the North Star from the Pole; by which may be found the Latitude, as ſhall be ſhewed in Order.

1. *To find the Hour of the Night.*

1. Place the Index of the ſecond, or middle Piece, to the Day of the Month; where it is to be kept, 'till the Obſervation is ended; then taking the Handle in your Hand, with the Fore-ſide towards you, and holding it upright, (which you may diſcern when you do ſo, by the Tip on the Top of the firſt or great Part of the Nocturnal) look through the Hole in the Center for the North Star.

2. Turn the Edge of the long Index, which proceedeth from the Center to the Guard, ſeeing at the ſame Time the North Starth rough that Hole; then will the Index ſhew the Hour of the Night on the ſecond, or middle Part.

The Figure of the NOCTURNAL.



2. To find the Bearing of the *Guards*, either of the Little or Great Bear; that is, upon what Point of the Compaſs they are, and thereby the North Star's Declination from the Pole.

1. Having obſerved all the particular Directions as before, in finding the Hour of the Night, you muſt ſee the North Star through the Hole, and the *Guards* by the Edge of the long Index.

2. Then look on the Back-ſide of the *Nocturnal*, what Point of the Compaſs ſtandeth againſt the foreſaid Edge of the Index, which is the bearing of the *Guards*; and at the ſaid Point of the Compaſs is figured the North Star's Declination from the Pole at that Time, either above or under.

Note; As the Nocturnals are made to fit the *Old-Stile*, the Index muſt be adjuſted, in all Problems relating to Time, by fixing it eleven Days backward from that Obſervation.

Example 1. The 31ſt of *December*, or the 20th, O.S. at Six of the Clock in the Morning, obſerving the *Pointers* or *Gnards* of the Great Bear by the Edge of the Index: I demand their Bearing, and Declination of the North Star.

Right againſt the Edge of that Index you obſerve with, and on the Back-ſide of the *Nocturnal*, is S.W. by S. the Point of the Compaſs required; and on the ſaid Point of the Compaſs is 2d. 33m. *und.* ſignifying the North Star is then 2d. 33m. under the Pole, in the Circle marked *G.B.*

Example 2. The 7th of *March*, or 24th of *Feb.* O.S. I obſerve (according to the Directions before given) at Seven of the Clock in the Evening, the *Fore Guard* of the Little Bear by the Edge of the long Index: I demand its Bearing, and Declination of the North Star?

Seeing the North Star thro' the Hole in the Middle, and the *Guard* of the *Little Bear* by the Edge of the long Index, (note always that Edge reſpecting the Center of the Inſtrument) and the Index cutting Seven of the Clock; then on the Back-ſide of the *Nocturnal*, and againſt the ſaid Edge of the Index, is N.E. the Point of its Bearing; and on the ſaid Point is figured 0d. 35m. *Abo.* which ſignifieth the North Star is then 35 Minutes above the Pole, in the Circle marked *L.B.*

3. To

3. *To find the Moon's Southing by the* Nocturnal.

To do this, look for the Moon's Age in the outermoſt Circle, on the middle or ſecond Piece on the Nocturnal; and right againſt it in the innermoſt Circle of the ſame Piece is the Southing.

Example. *If the Moon be* 19 *Days old, I demand her Southing?*

Right againſt 19, in the outermoſt Circle, is almoſt 3½ in the innermoſt Circle; which is half an Hour paſt Three of the Clock in the Morning nearly, the Time of the Moon's coming to the South.

4. *To find the Time of Full Sea by the* Nocturnal.

1. Set the ſhort Index of the middle Part which ſtands at 12, to the Time of Full Sea, on the New or Full Moon (for the Place propoſed) in the innermoſtCircle of the greatPiece.
2. Keeping that there, bring the long Index to the Moon's (Southing, or) Age, on the middle Piece.
3. Then right againſt the long Index, and in the innermoſt Circle on the gaeat Piece, is the Time of Full Sea required.

Example. *The Moon being* 19 *Days old, I demand the Time of Full Sea at* Graveſend?

1. Bring the Index of the middle Part (which ſtands at 12) to 1½ Hour (which is N.N.E. and S.S.W. the Point of the Compaſs making Full Sea at *Graveſend*, on the New and Full Moon) in the innermoſt Circle of 24 Hours on the great Piece, keeping that faſt there.
2. Turn the long Index to 19 Days (the Moon's Age, or to 3½ Hours the Moon's Southing) on the middle Piece.
3. Then right againſt the long Index, and in the innermoſt Circle (on the great Piece) is 5 Hours, the Time of Full Sea, or High-Water in the Morning, at *Graveſend.*

To

5. *To find the Latitude by the* Nocturnal *and* Fore-ſtaff.

1. Find the North Star's Declination from the Pole by obſerving with the Nocturnal, as directed in Example 1, or 2, of its Uſe, in Page 171.

2. Then at the ſame Time with a Fore-ſtaff, take the Altitude of the North Star.

3. If the North Star be above the Pole, ſubtract its Declination from (if under, add to) its Altitude; The Sum or Difference is the Latitude required, North.

Example. Suppoſe the 7th of *March*, or 24th of *Feb.* O.S. at Seven of the Clock in the Evening, obſerving with the Nocturnal, you find the *Guard* of the Little Bear to bear N.E. which is 0d. 35m. above the Pole; and at the ſame Time, by the Fore-ſtaff, find the Altitude of the North Star 42d. 10m. I demand the Latitude of the Place?

	D.	M.	
From the Altitude of the North Star - -	42 :	10	
Subtract its Declination above the Pole -	00 :	35	
Remainder is the Latitude required - - -	41 :	35	North

Example 2. The 31ſt of *December*, or 20th, *O.S.* at Six o'Clock in the Morning, obſerving with the Nocturnal, I find the *Guards* or *Pointers* of the *Great Bear* S.W. by S. which is 2d. 33m. under the Pole; and at the ſame Time, by the Fore-ſtaff, find the Altitude of the North Star 45d. 22m. I demand the Latitude of the Place of Obſervation?

	D.	M.	
To the Altitude of the North Star - - -	45 :	22	
Add its Declination from the Pole under	02 :	33	
Sum is the Latitude required - - - - - - -	47 :	55	North

The Deſcription and Uſe of Gunter's Scale.

THIS Inſtrument for its quick and eaſy Diſpatch of the moſt common and uſeful Proportions, deſerves as generally to be known in its Uſes, as by its Name: On that Account we ſhall firſt give a Deſcription thereof, and then with as much Clearneſs and Brevity as poſſible, its manifold Uſes.

1. *Gunter's Scale* (ſo called from Mr. *Gunter*, its firſt Contriver) is uſually made of Box Wood, commonly two Feet long, and one Inch and a half broad; on which are placed the Lines or Scales of Numbers, Sines, Tangents, *&c.* There are two Sorts, the long or Flat Gunter, and the Sliding-Gunter: On both Sorts are the ſame Lines, though differently uſed; the firſt Sort with the Compaſſes, the latter by Sliding.

2. The Lines generally ſet on *Gunter*'s, are eight, and have their Names at the Right-hand End thereof, under one another, thus; Sine Rumb, Tang. Rumb, Numbers, Sines, Verſed Sines, Tangents, Meridian (or Meridional Parts) and equal Parts.

3. The Sine Rumb, and Tang. Rumb, are both Points of the *Mariner's Compaſs*; the firſt is figured from the Left-hand towards the Right, with 1, 2, 3, 4, 5, 6, 7, and 8, at which is a Braſs Center-pin; the latter is figured thus, 1, 2, 3, and 4, at the ſaid Center-pin; and thence back again towards the Left-hand with 5, 6, and 7; each Point in both Lines (where it can) is ſubdivided into Halves and Quarters: Theſe two Lines are only uſeful in Navigation.

4. The next under Tang. Rumb, is the Line of Numbers figured thus; near the Left-hand End it begins at 1, and towards the Right-hand is 2, 3, 4, 5, 6, 7, 8, 9; then 1 is the Middle, at which is a Braſs Center-pin; going ſtill on 2, 3, 4, 5, 6, 7, 8, 9, and 10 at the End, where is another Center-pin: This Line is of general Uſe, and requires the larger Account; wherefore take theſe three following Notes for the Line of Numbers.

Note 1. *All the Figures on this Line may be taken ſingly as they ſtand; or be increaſed, or diminiſhed at Pleaſure, ſo it be in Decuple or Ten-fold Proportion.* That is, the firſt 1 may be counted for 1, or 10, or 100, or 1000, *&c.*

then the next 2 is accordingly 2, or 20, or 200, or 2000, &c. Again, the firſt 1 may be reckoned for 1 Tenth, or 1 Hundredth, or for a Thouſandth Part. &c. then the next 2 is 2Tenths, or 2 Hundredths, or 2 Thouſandth Parts,&c.

So that if the firſt 1 be eſteemed 1, the middle 1 is then 10; and 2 to its Right-hand is then 20, 3 is 30, 4 is 40, and 10 at the End is 100. Again, if the firſt 1 be counted 10, the next 2 is 20, 3 is 30, and ſo on, making the middle 1 now 100; the next 2 is 200, 3 is 300, 4 is 400, and 10 at the End is now 1000.

In like Manner, if the firſt 1 be eſteemed for 1 Tenth Part, the next 2 is Tenths, and the Middle 1 is 1; and the next 2 is 2, and 10 at the End is now 10. Again, if the firſt 1 be counted for one Hundredth Part, the next 2 is 2 Hundredth Parts; the Middle 1 is now 10 Hundredth Parts, or 1 Tenth Part; and the next 2 is 2 Tenth Parts; nd 10 at the End, is now but 1 whole Number or Integer.

Note 2. *As the Figures are increaſed, or diminiſhed in heir Value, ſo in like Manner muſt all the intermediate trokes or Subdiviſions be increaſed or decreaſed:* That s, if the firſt 1 (at the Left-hand) be counted 1, then 2 on the Right-hand of it) is 2; and each Subdiviſion beween them now is one Tenth Part, and ſo all the Way o the Middle 1, which now is 10; the next 2 is 20. ow the longer Strokes between 1 and 2 are to be counted om 1, thus 11, 12, where is a Braſs-pin) then 13, 14, , (ſomething a longer Stroke than the reſt) then 16, 17, 8, 19, and 20, at the Figure 2: And all the ſhorter rokes between theſe longer are now each to be counted r a Tenth Part; from the Middle 1 to the next 2, now o; from whence the longer Strokes between the Figures e Units, thus 21, 22, 23, &c. to 3, which now is 30; d the ſhorter Strokes between them, each now is a Tenth rt of an Integer: from 3, each ſhort Stroke (or little iviſion) is five Tenth Parts of an Unit.

Again, If 1 at the Left-hand be Ten, the Figures between it and the Middle 1 are common Tens, and the Subdiviſions (between each Figure) are Units, and from the Middle 1 to 10 at the End, each Figure is ſo many Hundreds; and between theſe Figures, each longer Diviſion is Ten; and from the middle 1 to 2, each leſs Diviſion is an Unit; from 2 to 3, each leſs Stroke is two Units; from the Figure 3 to the End, each ſhorter Stroke is five Units.

Some Scales are otherwiſe ſubdivided, which the Reader will attend unto, and thence very eaſily aſcertain the value of each Subdiviſions, if what is aforementioned be duly underſtood.

Note 3. On the *Line of Numbers* may be counted a Number of any Denomination; whether Meaſure, as Inches, Feet, Yards, Miles, Leagues, *&c.* or Weight, as Hundreds, Pounds, Ounces, *&c.* or Money, as Pounds, Shillings, Pence, *&c.* or Time, as Years, Months, Days, Hours, *&c.* provided always the Integer be divided, or ſuppoſed to be divided decimally, or into Tens.

5. Next under Numbers is the Line of *Sines*, beginning at the Left-hand, and figured thus, 1, 2, 3, *&c.* to 10; then 20, 30, 40, *&c.* to 90, ending at the Right-hand, where is a Braſs Center-pin: Theſe Figures never change their Value or Denomination, being here (and in all other Lines under it) called Degrees.

From the Beginning of this Line to 10 Degrees, each Degree is commonly divided into 12 Parts, by longer and ſhorter Strokes, making each 5 Minutes; from 10 Degrees to 20, each ſmaller Stroke has 10 Minutes; from 20 to 30 Degrees, each is fifteen Minutes; from thence to 60 Degrees, ſome are twenty, but the moſt are thirty Minutes; and from 60 to 80 Degrees, each Diviſion is a Degree; 80 and 90 are ſo near together, that they admit but of one Stroke between, which is for 85 Degrees.

6. Next to the Line of Sines, is the *Line* of *Verſed-Sines*, beginning at the Right-hand againſt 90, (in the Sines) and from thence figured towards the Left-hand

thus, 10, 20, 30, 40, *&c.* ending at (the Left-hand End) about 169 Degrees; the Subdiviſions are thus, from 10 to 30, each is 2 Degrees; from thence to 90, it's single Degrees; from thence to 120, it's half Degrees; and from thence to the End, it's divided each into 15 Minutes.

7. *Under Verſed Sines* is the *Line of Tangents*, beginning at the Left-hand, as the *Sines* do; from thence figured to the Right-hand, thus, 1, 2, 3, *&c.* to 10; and ſo on, 20, 30, 40, and 45 at the Right-hand, where is a little Braſs Center-pin, juſt under and even with 90 in the *Sines*; from thence back again it is figured 50, 60, 70, 80, *&c.* to 89: ending at the Left-hand End, where it began at 1 Degree: The Subdiviſions of this Line are the ſame as thoſe of the Sines.

8. Next to the Line of *Tangents*, and under it, is the *Line of Meridional Parts*, beginning at the Right-hand, and is numbered thus, 10, 20, 30, *&c.* to the Left-hand, where it ends at 87 Degrees. This Line, with the *Line of equal Parts* under it, are uſed together, only in *Mercator's Sailing*; the uppermoſt Line contains the Degrees of the Meridian or Latitude in a *Mercator*'s Chart, and the lower is the Equator, and contains the Degrees of Longitude.

9. Theſe eight Lines thus ſubſcribed, are ſet on the *Sliding Gunter*, but not in the ſame Order, being ſome on one Side, and ſome on the other: Alſo the Line of Numbers, Sines, and Tangents, are ſet double, that is, one on each Side, as the middle Piece ſlides; which middle Piece is ſo contrived, as to ſlip to and fro eaſily; to ſlide out, and to be put in, any Side uppermoſt, in order to range theſe Lines together; or againſt one another, moſt proper for ſolving the Queſtions wrought by the *Sliding Gunter*: Of which this ſhort Deſcription may ſuffice.

I. *The Uſe of* Gunter's Scale, *both ſingle and ſliding, in* Arithmetic.

IN order to a right Underſtanding of the Uſe of this Scale, it's neceſſary to Number well on it; that is, to find readily a Place repreſenting any given Number, Point, or Degree, *&c.* but chiefly on the Line of Numbers; which is as follows.

PROBLEM I. *To find a whole Number on the Line of Numbers.*

Rule 1. LOOK the firſt Figure of the given Number among the figured Diviſions.

2. For the ſecond Figure, count ſo many Tenths (or longer Strokes) from the figured Diviſion, towards the Right-hand, as are Units in the ſaid ſecond Figure.

3. Then for the third Figure, count from the laſt Tenth (repreſenting the ſecond Figure) ſo many leſſer Strokes (or Centeſms) as that Figure hath Units.

4. In like manner, for the fourth Figure, count from the laſt Centeſin ſo many Thouſands (or leſſer Strokes) as are Units in it: and ſo on, for more Figures, though four Figures, or Thouſands, are as many as can well be diſcerned on a two Foot Gunter.

5. This done, the laſt Place is the Point where the propounded Number is repreſented.

Example 1. To find the Point in the Line of Numbers that doth repreſent 12?

According to the Rule above, I take the Diviſion at the Figure 1 (in the middle of the Line of Numbers) for the firſt Figure of 12, the propounded Number; then for 2, the ſecond Figure, I count 2 Tenths (or longer Strokes to the Right-hand) from the ſaid Stroke at 12; and this laſt is the Point repreſenting 12, where moſt commonly is a ſmall Braſs Center-pin, being oft in Uſe.

Exampl

Example 2. Suppoſe the Point repreſenting 22, on the Line of Numbers, was required to be found?

The firſt Figure in the Number 22 being 2, I take the Diviſion in the Figure 2 for it; and for the ſecond Figure 2, I count 2 Tenths onwards; and that is the Point repreſenting 22.

Example 3. I deſire to know the Point on the Line of Numbers, that repreſents 144?

The firſt Figure being one, I take the Diviſion at the Middle 1 for it; the ſecond Figure being 4, I count 4 Tenths onwards, and that is 140; from thence count 4 Centeſms farther: for the third and laſt Figure; This laſt Place is the Point repreſenting 144.

Example 4. Let it be required to find, on the Line of Numbers, the Point repreſenting 1728?

For the firſt Figure 1, take the middle 1; for the ſecond Figure 7, count as before, onward, 7 Tenths, and that is 1700: Then for 2, the third Figure count 2 Centeſms from the laſt, and it repreſents 1720: laſtly, for the fourth Figure 8, eſtimate 8 thouſand Parts from the laſt: This Point laſt found repreſents 1728.

PROB. II. *To find a Fraction, or broken Number, on the Line of Numbers.*

THE Fractions to be found on this Line muſt always be Decimals; as theſe, 1, .01, .001; 2, .02, .002. *&c.* that is, $\frac{1}{10}$, $\frac{1}{100}$, $\frac{1}{1000}$, $\frac{2}{10}$, $\frac{2}{100}$, $\frac{2}{1000}$, *&c.* either of Inches, Feet, Yards, Miles, or the like; alſo in Weight, or Time, or any other Denomination whatſoever.

So that all other Fractions muſt be reduced into Decimals, before they can be found on the Line of Numbers; and being ſo reduced, they are expreſſed and found upon this Line as whole Numbers by the Rule in *Problem* I. and need no Example.

PROB. III. *To perform Multiplication by the Line of Numbers.*

The RULE is,

AS 1 is to the Multiplier, ſo is the Multiplicand to the Product.

Now to work this, or any Proportion on the *Gunter*, this is a general Rule.

1. Extend the Compaſſes from the firſt Term to the ſecond Term.

2. That Extent laid the ſame way from the third Term, will reach to the fourth Term, or Thing required.

By the *Sliding Gunter*, thus;

1. Set the firſt Term counted on the ſliding or middle Piece, right againſt the ſecond Term counted on the fixed Piece.

2. Then ſeek the third Term, (always on the ſame Piece, the firſt Term was counted) and againſt it on the other Part is the fourth Term, or Thing required.

Example 1. What is the Product of 8 multiplied by 4?

The Analogy or Proportion is this: As 1 is to 4; ſo is 8 to the Product.

Or, it's thus: As 1 is to 8; ſo is 4 to the Product.

1. By the *Gunter* with Compaſſes, thus;

Extend the Compaſſes from 1 to 4: that Extent laid from 8 (the ſame way) reacheth to 32, the Product of 8 multiplied by 4.

Or the Extent from 1 to 8, being laid from 4, reacheth to 32, the Product as before.

2. By the *Sliding-Gunter*, thus;

Set 1 at the beginning of the middle or ſliding Piece, right agaiſt 4 on the fixed or outſide Piece; then againſt 4 on the firſt, is 32 on the ſecond, the Product required.

Or (ſet as before) 1 againſt 8; then againſt 4 on the firſt, is 32 on the ſecond, the Product, as before.

Example 2. What is the Product of 16, multiplied by 5? The Proportion to work it by, is this: As 1 is to 5; ſo is 16 to the Product.

1. By *Gunter* with Compaſſes, it's thus;

The Extent from 1 to 5 being laid from 16, reacheth to 80, the Product required.

2. By the *Sliding Gunter*, thus;

Set 1 on the middle Piece, againſt 5 on the out-ſide Piece; then againſt 16 on the firſt, is 80 on the ſecond, the Product as before.

PROB. IV. *To perform Diviſion by the Line of Numbers.*

The Rule or Proportion is thus;

AS the Diviſor is to 1, ſo is the Dividend to the Quotient.

Example 1. If the Dividend be 64, and the Diviſor 4; what is the Quotient?

To do this, the Proportion is; As 4 is to 1, ſo is 64 to the Quotient required.

1. By *Gunter* with Compaſſes, thus;

The Extent from 4 to 1, laid (the ſame way) from 64 reacheth to 16, the Quotient required.

2. By the *Sliding Gunter*, thus;

Set 4 on the outſide Piece, againſt 1 on the middle Piece; then againſt 64 on the firſt, is 16 on the ſecond; which is the Quotient as above.

Example 2. How often is 144 contained in 1728?

To do this, the Proportion is thus: As 144, is to 1; ſo is 1728, to the Anſwer.

1. By *Gunter* with Compaſſes, thus;

The Extent from 144 to 1, reacheth from 1728 to 12, the Quotient and Anſwer required.

2. By the *Sliding Gunter*, thus;

Set 144 on the outſide Piece, againſt 1 on the middle Piece: then againſt 1728 on the firſt, is 12 on the ſecond, which is the Quotient as above.

PROB. V. *To reduce a Vulgar Fraction to a Decimal by the Line of Numbers.*

To perform this, the Proportion is thus;

AS the Denominator of the given Fraction, is to its Numerator; ſo is 1 to the Decimal Fraction required.

Example. Suppoſe it be required to reduce $\frac{3}{4}$, a Vulgar Fraction into a Decimal Fraction?

Note, A Decimal Fraction hath for its Denominator an Unit, with as many Cyphers as its Numerator hath Places, and the Proportion to find the Numerator is thus; As 4 is to 3, ſo is 1 to the Numerator of the Decimal Fraction required.

1. By *Gunter* with Compaſſes, thus;

The Extent from 4 to 3 reacheth (the ſame Way) from 1, to .75, or $\frac{75}{100}$, the Decimal Fraction required.

2. By the *Sliding Gunter*, thus;

Set 4 on the outſide Piece, againſt 3 on the middle Piece; then againſt 1 on the firſt is .75, or $\frac{75}{100}$ on the ſecond, the Decimal Fraction required to be found: So that 75, or $\frac{75}{100}$, is equal in Value to $\frac{3}{4}$.

PROB. VI. *Of Continual Proportion, or Geometric Progreſſion; which is unto two given Numbers, to find a 3d, 4th, 5th, &c. Number in a continual, or continued Proportion, by the Line of Numbers.*

The Analogy by which it is effected, is this;

AS the firſt Number given is to the ſecond; ſo is the ſecond to the third; and ſo is that third, to a fourth; and ſo is that fourth to a fifth, *&c.*

Example. Let the two Numbers given be 2 and 4, unto which it's required to find a third, fourth, *&c.* Proportional.

For the Performance hereof, the Rule is thus;

As 2 is to 4, ſo is 4 to a third; and ſo is that third to a fourth, *&c.*

1. By *Gunter* with Compaſſes, thus;

The Extent from 2 to 4 reaches from 4 to 8, the third; and from 8 to 16, the fourth; and from 16 to 32, the fifth Proportional Number; and ſo on, to as many as you pleaſe: So that 2, 4, 8, 16, 32, *&c.* are Numbers in continued Geometric Proportion, as was required.

2. By the *Sliding Gunter*, thus;

Set 2 on the middle Piece, to 4 on the outſide Piece; then againſt 4 on the firſt, is 8 on the ſecond, for the third Proportional; and againſt 8 on the firſt is 16 on the ſecond, the fourth Proportional; and in like Manner againſt 16 is 32, the fifth Proportional, as was required: And ſo on for more.

PROB. VII. *Of the Rule of Three Direct, or three Numbers being given, to find a fourth in a direct Proportion, by the Line of Numbers.*

The Analogy whereby this is performed, is thus;

AS the firſt Number is to the ſecond; ſo is the third to the fourth Number required.

Example 1. If the Diameter of a Circle be 7 Inches, and the Circumference thereof 22, what is the Circumference of a Circle, whoſe Diameter is 14 Inches?

To perform this, the Analogy is thus; as 7 is to 22? ſo is 14 to the Circumference required.

1. By *Gunter* with Compaſſes, thus;

The Extent from 7 to 22, (laid the ſame Way) from 14, will reach to 44, the Circumference of the Circle, whoſe Diameter is 14; which was required.

2. By the *Sliding Gunter*, thus;

Set 7 on the middle Piece, againſt 22 on the outſide Piece; then againſt 14 on the firſt, is 44 on the ſecond, which is the Circumference, as above.

Example 2. If the Circumference of a Circle is 3.14 or 3 $\frac{14}{100}$, and its Diameter 1; what will the Diameter of another Circle be, whoſe Circumference is 44?

The Proportion is; As 3 $\frac{14}{100}$ is to 1; ſo is 44 to the Diameter required.

1. By *Gunter* with Compaſſes, thus;

The Extent from 3 $\frac{14}{100}$ to 1, reacheth from 44 to 14, the Diameter required.

2. By the *Sliding Gunter*, thus;

Set 3 $\frac{14}{100}$ on the outſide Piece, right againſt 1 on the middle Piece: then againſt 44 on the firſt, is 14 on the ſecond, which is the Diameter required, as before.

Note, In the *Rule of Three Direct*, if the third Number be greater than the firſt, then will the fourth Number be greater than the ſecond: But if the third Number be leſs than the firſt, then the fourth will be leſs than the ſecond.

Example 3. If 30 Acres of Land be worth 25 Pounds a Year; how much a Year will 54 Acres be worth.

To do this, or any Queſtion in the *Rule of Three*, always in the Proportion let the firſt and third Numbers or Terms be of one Kind or Denomination; and then thus it is: As 30 Acres is to 25 Pounds; ſo is 54 Acres to 45 Pounds.

1. By the *Gunter* with Compaſſes, thus:

The Extent from 30 to 25, reacheth from 54 to 45 the yearly Rent required.

2. By the *Sliding Gunter*, it's thus:

Set 30 againſt 25, then againſt 54 on the firſt, is 45 on the ſecond, as before.

By this Time, the Reader is, we preſume, ſo well acquainted in the Way of Working a Proportion on the Line of Numbers, with Compaſſes or without, that it's a needleſs Thing to expreſs it in Words, being always the ſame: We ſhall therefore for the future ſet down the Proportion, leaving the manner of its Operation to Practice, except in Caſes where the Working differs from what went before.

PROB. VIII. *Of the Rule of Proportion Inverſe, or Three Numbers given, to find a fourth in an Inverſe Proportion, or in the backward Rule of Three, by the Line of Numbers.*

IN this Rule you muſt note, if the third Number be greater than the firſt, then will the fourth be leſs than the ſecond. But,

2. If the third be leſs than the firſt, the fourth is to be greater than the ſecond.

3. And to reſolve Queſtions in the backward Rule of Three, the Proportion is thus;

As the third Number is to the ſecond; ſo is the firſt to the fourth.

Example. If 72 Pioneers make a Trench in 48 Hours, in how long Time will 54 Pioneers make it?

By the Directions above, this is the Proportion: As 54 Men is to 48 Hours; ſo is 72 Men to 64 Hours, the Anſwer to the Queſtion: From whence you may conclude that 54 Men will perform as much in 64 Hours, as 72 Men in 48 Hours.

PROB. IX. *Of Duplicate Proportion, or three Numbers given, to find a fourth in a Duplicate Proportion by the Line of Numbers.*

THIS Rule is chiefly uſed in Proportion of Lines to Superficies, &c. wherein the firſt and ſecond Terms are to be of one Kind or Denomination.

Example 1. If the Diameter of a Circle be 1, and its Area or Content 0.78539; what's the Content of a Circle whoſe Diameter is 14?

To perform this, the firſt and ſecond Terms (by the Note above) are to be Lines; that is, the Diameters given, and then the Proportion is thus: As 1 is to 14; ſo is 0.785 to a fourth; And ſo is that fourth to the Content required.

1. By *Gunter* with Compaſſes, it's thus;

The Extent from 1 to 14 reacheth from 0.785 to 11; and the ſame Extent laid the ſame Way from 11, reacheth to 154, the Content required.

2. By the *Sliding Gunter*, it's thus;

Bring 1 on the middle Piece, right againſt 14 on the outſide Piece; then againſt 0.785 on the firſt, is 11 on the ſecond; and againſt 11 on the firſt, is 154 on the ſecond, the Content as before.

Example 2. If the Diameter of a Circle be 7, and its Area 38.5; what is the Area of a Circle, whoſe Diameter is 12? *Anſwer* 113. For,

As 7 is to 12, ſo is 38.5 to 66; and ſo is 66 to 113, the Area required.

Example 3. If the Diameter of a Circle be 1, and its Area 0.78539: what is the Diameter of a Circle whoſe Area is 154? *Anſwer*, 14 is its Diameter.

In this, the Proportion is of Superficies to Lines, which is thus; As Area 0.785, is to Area 154; ſo is the Square of the Diameter 1, to the Square of the Diameter required.

1. By *Gunter* with Compaſſes, it's thus;

The Extent from 0.785, to 154, reacheth from 1 to 196, the Square of the Diameter required.

Then divide the Space between 1 (always the middle 1, if the Number of Places be odd; but if even, the firſt 1) and 196 into two equal Parts; the Foot of the Compaſſes in the middle reſteth at 14, the Diameter of the Circle, whoſe Area is 154.

2. By the *Sliding Gunter*, it's thus;

Set 0.785 againſt 154, and againſt 1 on the firſt, is 196, on the ſecond; then find the middle between 1 and 196, which is at 14, the Diameter as before.

Example 4. The Diameter of a Circle being 1, and its Area, 0.785 what is the Diameter of a Circle whoſe Area is 113? *Anſwer*, 12 is the Diameter required.

For as 0.785 is to 113, ſo is 1 to 144; the middle between it and 1, is at 12, the Diameter required.

PROB. X. *Of Triplicate Proportion, or three Numbers given, to find a fourth in a Triplicate Proportion by the Line of Numbers.*

THIS Problem concerneth the Proportion of Lines to Solids, and the contrary; in which, always make the firſt and ſecond Term to be of one Denomination.

Example 1. If an Iron Bullet weigh 9 Pounds, and its Diameter is 4 Inches, what is the Weight of another Iron Bullet whoſe Diameter is 6 Inches.

To perform this, the firſt and ſecond Terms are to be Lines, that is, the given Diameters; and then the Proportion is thus:

As 4 is to 6; ſo is 9 to 13.5; and ſo is 13.5 to 20.2; and ſo is 20.2 to 30.3; that is 30 Pounds and 3 Tenths of a Pound, which is the Weight required.

That is, 1. By *Gunter* with Compaſſes, thus;

The Extent from 4 to 6 being laid three Times from 9, will reach to 30 Pounds 3 Tenths, the Weight required.

And, 2. By the *Sliding Gunter*, it's thus;

Set 4 againſt 6, and againſt 9 on the firſt is 13.5 on the ſecond; then againſt 13.5 on the firſt, is 20.2 on the ſecond; and againſt 20.2 on the firſt, is 30.3 on the ſecond; that is 30 Pounds 3 Tenths, as before.

Example 2. If an Iron Bullet 1 Inch Diameter, weigh Pounds 0.1406 Parts; what is the Weight of another, whoſe Diameter is 4 Inches, it being of the ſame Metal? *Anſwer*, 9 Pounds. For,

As 1 is to 4; ſo is 0.1406, to 0.562; and ſo is 0.562 to 2.25; and ſo is 2.25, to 9 Pounds, the Weight required.

Example 3. If a Gun 6 Inches Bore require 11 Pound of Powder, how much will ſerve a Gun 4 Inches Bore? *Anſwer*, Pounds 3.25 Parts.

For, As 6 is to 4; ſo is 11 to 7.3; and ſo is 7.3, to 4.88; and ſo is 4.88 to 3.25; which is Pounds 3.25 Parts of a Pound, or Pounds 3 ¼ of Powder.

Example 4. If an Iron Bullet 1 Inch Diameter, weigh Pounds 0.1406 Parts; what Diameter ſhall that be, which weigheth 9 Pounds of the ſame Metal? *Anſwer*, 4 Inches.

For it's thus; As 0.1406, is to 9; ſo is 1 to 64, the Cube of the Diameter required; then divide the Space between 1 and 64 into 3 equal Parts, and the Foot of the Compaſſes in the firſt ⅓ Part from 1 reaching to 4, the Diameter of the Iron Shot weighing 9 Pounds.

II. *The Uſe of the Line of Numbers commonly called* Gunter's Line, *in meaſuring Superficies, as Board, Glaſs, Land,* &c.

PROB. I. *The Length and Breadth of any Square, or Long-Square Superficies given, to find the Area or Content thereof.*

THE Proportion is this; As 1 is to the Breadth, ſo is the Length to the Content.

Example 1. A plane Superficies, as a Board or Plank given to be meaſured, the Breadth thereof is 15 Inches, and its Length 61 Inches; what is the Content of it? *Anſwer*, 915 Inches.

For, As 1, is to 15; ſo is 61, to 915 Inches, the Content required.

Note, Such as the Breadth and Length are, ſuch is the Content; ſo that if the Breadth and Length be Feet, the Content is Feet; if Perches, then Perches, &c.

Example 2. A Piece of Wainſcot in Form of a Long Square, whoſe Length is Feet 15.5 Parts, and Breadth Feet 2.25 Parts; what is the Content? *Anſwer*, Feet 34.87 Parts. For as 1, is to 2.25; ſo is 15.5, to 34.87; that is, Feet 34 and 87 Parts is the Content.

PROB. II. *The Breadth and Length of a Superficies given in one Kind of Meaſure, to find the Content thereof in another Kind of Meaſure.*

TO do this, the Proportion is thus: As the Number contained in the Area of Unity in the required kind of Meaſure, is to the Breadth; ſo is the Length, to the Content deſired.

Example 3. A Plank or Board 15 Inches broad, 61 Inches long, I demand the Content of it in Feet? *Anſwer*, Feet 6.35 Parts of a Foot. For you muſt note, in a Foot Superficial, or a Square Foot, is 144 Square Inches; and therefore the Proportion is thus: As 144, is to 15 Inches; ſo is 61 Inches, to Feet 6.35 Parts of a Foot, the Content.

Example 4. A Piece of Land in Form of a Long Square, whoſe Breadth being 30 Perches, Length 183 Perches: what is the Content in Acres? *Anſwer*, Acres 34.31 Parts.

Note, 160 Perches is an Acre, and the Proportion is thus:

As 160 Perches, is to 30 Perches; ſo is 183 Perches, to Acres 34.31 Parts of an Acre, the Content of the Piece of Land.

Example 5. A Piece of Painting, in Form of a Long Square, whoſe Breadth in Feet is 3.5, and Length 21 Feet how many Square Yards is the Content? *Anſwer*, Yards 8.16 Parts of a Yard.

Note, 9 Feet is a Square Yard, and the Proportion is thus:

As 9, is to 3.5 Feet; ſo is 21 Feet, to Yards 8.16 Parts of a Yard, the Content.

PROB. III. *The Breadth of a Superficies given in one Kind of Meaſure, and the Length of another; to find the Content in the greater Meaſure.*

TO do this, the Proportion is thus; As ſo many of the leſſer Kind of the given Meaſure, as is equal to the Length of one of the required Meaſure, is to the given leſſer Meaſure; ſo is the given greater Meaſure, to the Content, in the Meaſure required.

Example 6. Admit a Board of 10 Inches broad, and 20 Feet long, I demand the Content in Feet? *Anſwer*, Feet 16.6 Tenths of a Foot.

For the Proportion is thus; As 12, is to 10 Inches; ſo is 20 Feet, to Feet 16.6 Tenths.

Example 7. If a Board or Plank be 15 Inches broad, and 27 Feet long, what is the Content of it in Feet? *Anſwer*, Feet 33.75 Parts of a Foot, or $33\frac{3}{4}$ Feet. For, As 12, is to 15 Inches; ſo is 27 Feet, to 33.75 Parts.

Example 8. A Board $7\frac{1}{2}$ Inches Broad, and $29\frac{1}{4}$ Feet long, what's the Content in Feet? *Anſwer*, Feet 18.28. For it's, As 12 is to $7\frac{5}{10}$; ſo is $29\frac{25}{100}$, to Feet 18.28 Parts.

Example 9. A Piece of Land (in Form of a Long Square) whoſe Breadth is 30 Perches, and Length in Chains 15.25 Links (meaſured by a Chain of 4 Perches in 100 Links) I demand the Content thereof in Acres? *Anſwer*, Acres 11.44. For it's, As 40, is to 30 Perches; ſo is Chains 15.25, to Acres 11.44 Parts of an Acre.

PROB. IV. *The Breadth of a Superficies given, to find how much in Length will make a Foot, a Yard, a Perch, or an Acre*, &c.

TO do this, take this General Rule: As the Breadth is to a Foot, a Yard, *&c.* ſo is a Foot, a Yard, *&c.* to that Length which will make a Foot, a Yard, *&c.*

Example 2. A Piece of Wainſcot in Form of a Long Square, whoſe Length is Feet 15.5 Parts, and Breadth Feet 2.25 Parts; what is the Content? *Anſwer*, Feet 34.87 Parts. For as 1, is to 2.25; ſo is 15.5, to 34.87; that is, Feet 34 and 87 Parts is the Content.

PROB. II. *The Breadth and Length of a Superficies given in one Kind of Meaſure, to find the Content thereof in another Kind of Meaſure.*

TO do this, the Proportion is thus: As the Number contained in the Area of Unity in the required kind of Meaſure, is to the Breadth; ſo is the Length, to the Content deſired.

Example 3. A Plank or Board 15 Inches broad, 61 Inches long, I demand the Content of it in Feet? *Anſwer*, Feet 6.35 Parts of a Foot. For you muſt note, in a Foot Superficial, or a Square Foot, is 144 Square Inches; and therefore the Proportion is thus: As 144, is to 15 Inches; ſo is 61 Inches, to Feet 6.35 Parts of a Foot, the Content.

Example 4. A Piece of Land in Form of a Long Square, whoſe Breadth being 30 Perches, Length 183 Perches: what is the Content in Acres? *Anſwer*, Acres 34.31 Parts.

Note, 160 Perches is an Acre, and the Proportion is thus:

As 160 Perches, is to 30 Perches; ſo is 183 Perches, to Acres 34.31 Parts of an Acre, the Content of the Piece of Land.

Example 5. A Piece of Painting, in Form of a Long Square, whoſe Breadth in Feet is 3.5, and Length 21 Feet how many Square Yards is the Content? *Anſwer*, Yards 8.16 Parts of a Yard.

Note, 9 Feet is a Square Yard, and the Proportion is thus:

As 9, is to 3.5 Feet; ſo is 21 Feet, to Yards 8.16 Parts of a Yard, the Content.

PROB. III. *The Breadth of a Superficies given in one Kind of Meaſure, and the Length of another; to find the Content in the greater Meaſure.*

TO do this, the Proportion is thus; As ſo many of the leſſer Kind of the given Meaſure, as is equal to the Length of one of the required Meaſure, is to the given leſſer Meaſure; ſo is the given greater Meaſure, to the Content, in the Meaſure required.

Example 6. Admit a Board of 10 Inches broad, and 20 Feet long, I demand the Content in Feet? *Anſwer*, Feet 16.6 Tenths of a Foot.

For the Proportion is thus; As 12, is to 10 Inches; ſo is 20 Feet, to Feet 16.6 Tenths.

Example 7. If a Board or Plank be 15 Inches broad, and 27 Feet long, what is the Content of it in Feet? *Anſwer*, Feet 33.75 Parts of a Foot, or 33 $\frac{3}{4}$ Feet. For, As 12, is to 15 Inches; ſo is 27 Feet, to 33.75 Parts.

Example 8. A Board 7 $\frac{1}{2}$ Inches Broad, and 29 $\frac{1}{4}$ Feet long, what's the Content in Feet? *Anſwer*, Feet 18.28. For it's, As 12 is to 7 $\frac{5}{10}$; ſo is 29 $\frac{25}{100}$, to Feet 18.28 Parts.

Example 9. A Piece of Land (in Form of a Long Square) whoſe Breadth is 30 Perches, and Length in Chains 15.25 Links (meaſured by a Chain of 4 Perches in 100 Links) I demand the Content thereof in Acres? *Anſwer*, Acres 11.44. For it's, As 40, is to 30 Perches; ſo is Chains 15.25, to Acres 11.44 Parts of an Acre.

PROB. IV. *The Breadth of a Superficies given, to find how much in Length will make a Foot, a Yard, a Perch, or an Acre,* &c.

TO do this, take this General Rule: As the Breadth is to a Foot, a Yard, *&c.* ſo is a Foot, a Yard, *&c.* to that Length which will make a Foot, a Yard, *&c.*

Example 10. If a Board be $7\frac{1}{2}$ Inches Broad, how much in Length will make a Foot ſquare? *Anſwer*, Inches 19.2 Tenths of an Inch.

For the Proportion is thus: As 7.5, is to 12; ſo is 12, to Inches 19.2 Tenths in Length, which will make a Foot.

Example 11. A Plank 30 Inches Broad, how much in Length will make a Foot? *Anſwer*, Inches 4.8 Tenths of an Inch.

For, as 30 Inches is to 12; ſo is 12 to Inches 4.8 Tenths in Length to make a Foot.

Example 12. A Pane of Glaſs being in Breadth Feet 2.5 Tenths, how much in Length will make a Foot? *Anſwer*, 4 Tenths of a Foot. For it's thus;

As 2.5, is to 1 Foot; ſo is 1 Foot to 0.4 Tenths of a Foot in Length to make a Foot.

Example 13. A Piece of Matting being 27 Inches broad, how much in Length will make a Yard ſquare? *Anſwer*, 48 Inches, or 4 Feet. For it's thus:

As 27 Inches, is to 36 Inches; ſo is 36 Inches, to 48 Inches: But if the Breadth be given in Feet, that is, if for 27 Inches, it be $2\frac{1}{4}$ Feet or 2.25 Feet, then it's thus;

As 2.25, is to 3 Feet; ſo is 3 Feet to 4 Feet in Length, to make a Yard ſquare.

PROB. V. *The Diameter of a Circle given, to find the Circumference.*

THE Analogy or Proportion is thus: As 1 is to 3.142, ſo is the Diameter to its Circumference.

Example 14. If the Diameter of a Circle be 15 Inches, what is the Circumference of it? *Anſwer*, Inches 47.13 Parts of an Inch.

For, as 1 is to 3.142; ſo is 15 Inches to Inches 47.13 Parts, the Circumference required.

PROB. VI. *The Circumference of a Circle being given, to find its Diameter.*

THE Proportion is this? As 3.142, is to 1; ſo is the Circumference, to its Diameter.

Example 15. The Circumference of a Circle being 44 Feet, what is the Diameter thereof? *Anſwer*, Feet 14, for it's,

As 3.142, is to 1; ſo is 44 Feet, to Feet 14 the Diameter.

PROB. VII. *The Diameter of a Circle being given, to find its Area, or ſuperficial Content.*

The Proportion is thus:

AS 1, is to the Diameter; ſo is 0.7854, to a fourth Number; and ſo is that fourth Number, to the ſuperficial Content required.

Example 16. The Diameter of a Circle being 15 Inches, what is the Content of it? *Anſwer*, Inches 176.7 Parts.

For it's as 1, is to 15; ſo is 0.8754, to 11.78; and ſo is 11.78, to 176.7, the ſuperficial Content required.

PROB VIII. *The Circumference of a Circle being given, to find the ſuperficial Content of it?*

The Proportion is this:

AS 1, is to the Circumference; ſo is 0.07958, to a fourth Number; and ſo is that fourth Number to the ſuperficial Content required.

Example 17. If the Circumference of a Circle be 44 Inches, what's the Content? *Anſwer*, Inches 154.06 Parts of an Inch. For it is,

As 1, is to 44; ſo is 0.07958, to 3.5; and ſo is 3.5, to Inches 154.06 the Content required.

III. *The Uſe of the Line of Numbers in Solid Meaſure, ſuch as Timber, Stone, Gauging,* &c.

PROB. I. *The Side of a Square Solid being given in Inches, to find how much in Length will make a Foot Solid?*

THE Proportion is thus: As the given Side, is to 12; ſo is 12 to a fourth Number; and ſo is that fourth Number, to the Length required to make a Foot Solid.

Example 1. A ſquare Piece of Timber, or Stone, whoſe Breadth and Depth are each 8 Inches; how much in Length will make a Foot Solid? *Anſwer*, 27 Inches, or 2 Foot 3 Inches; For it is, As 8 is to 12; ſo is 12 to 18; and ſo is 18, to 27 Inches in Length, to make a Foot.

Example 2. A ſquare Piece of Timber or Stone, whoſe Side is 2 Feet, or 24 Inches; how much in Length will make a Foot? *Anſwer*, 3 Inches. For it's as 24, is to 12; ſo is 12, to 6; and ſo is 6, to 3 Inches in Length, to make a Foot Solid.

PROB. II. *The Side of a Square Solid given in Foot Meaſure, (that is, the Decimal Foot, or a Foot divided into* 100 *equal Parts) to find how much in Length will make a Foot Solid.*

THE Proportion is thus: As the given Side, is to 1; ſo is 1, to a fourth Number; and ſo is that fourth Number, to the Length required, to make a Foot Solid.

Example 3. A ſquare Piece of Timber, whoſe Side is Feet 1.5.2 Parts; how much in Length will make a Foot Solid? *Anſwer*, 0.432 Parts of a Foot. For it's, As 1.52, is to 1; ſo is 1, to 0.658; and ſo is 0.658, to 0.432 Parts of a Foot.

PROB. III. *The Breadth and Depth of a Solid, whoſe two Ends are equal long Squares, being given in Inches, or in Foot Meaſure; to find how much in Length will make a Foot Solid?*

1. THE Proportion for Inches is thus: As 12, is to the Breadth; ſo is the Depth, to a fourth Number: Then,

As that fourth Number, is to 12; ſo is 12, to the Length in Inches to make a Foot Solid.

2. The Proportition for Foot-Meaſure is thus: As 1, is to the Breadth; ſo is the Depth, to a fourth Number. Then ſay, As that fourth Number, is to 1; ſo is 1, to the Length in Foot-Meaſure, to make a Foot Solid.

Example 4. A Piece of Timber or Stone, whoſe Breadth is 11 Inches, and Depth 19 Inches; how much in Length will make a Foot? *Anſwer*, Inches 8.27 Parts. For it's as 12, is to 11; ſo is 19, to 17.4: And then ſay, as 17.4 is to 12; ſo is 12, to Inches 8.27 Parts in Length, to make a Foot Solid.

Example 5. A Piece of Timber, in Breadth Foot 0.75 Parts, and Depth Foot 1.25 Parts; how much in Length will make a Foot Solid? *Anſwer*, Foot 1.06 Parts. For, it's as 1, is to 0.75; ſo is 1.25, to 0.94: Then ſay, As 0.94, is to 1; ſo is 1, to Foot 1.06 Parts in Length, to make a Foot Solid.

PROB. IV. *The Side of a Square Solid, and its Length being given, to find the Content.*

1. WHEN the Side is given in Inches, and Length in Feet, the Proportion is thus: As 12, is to the given Side; ſo is the Length, to a fourth Number; and ſo is that fourth Number, to the Content in Feet.

2. When the Side and Length are both given in Foot Meaſure, the Proportion is thus. As 1, is to the given Side; ſo is the Length, to a fourth Number; and ſo is that fourth Number, to the Content required.

Example 6. A ſquare Piece of Timber, whoſe Side is 9 Inches, and Length 35 Feet; how many Feet of Timber are in it? *Anſwer*, Feet 19.68 Parts. For it is,

As 12, is to 9; ſo is 35, to 26.25; and ſo is 26.25, to Feet 19.68 Parts, the Content required.

Example 7. A Piece of Timber 16 Inches ſquare, and 28 Feet long, how much is the Content? *Anſwer*, 50 Feet.

For it's as 12, is to 16; ſo is 28, to 37.3, and ſo is 37.3, to 49.8 Feet, the Content of the Piece of Timber.

Example 8. A Stone, Feet 2.75 Parts ſquare, and Feet 7.50 Parts long; how much is the Content? *Anſwer*, Feet 56.72 Parts.

For it's as 1, is to 2.75; ſo is 7.50 to 20.6; and ſo is 20.6, to Feet 56.72 Parts, the Content required.

PROB. V. *The Length, Breadth and Depth of a Square Solid being given, to find the Solid Content.*

1. If the Breadth and Depth be given in Inches, and the Length in Feet, the Proportion is thus; As 12, is to the Breadth; ſo is the Depth, to a fourth Number. Then ſay, As 12, is to that fourth Number; ſo is the Length in Feet, to the Content in Feet.

2. When the Length, Breadth, and Depth, are all given in Foot Meaſure, then the Proportion is thus: As 1 is to the Breadth; ſo is the Depth, to a fourth Number. And then again ſay, As 1 is to that fourth Number; ſo is the Length to the Content in Feet.

Example 9. If a ſquare Piece of Timber be in Breadth 19 Inches, Depth 11 Inches, and 20 Feet long; how much is the Solid Content? *Anſwer* Feet 29.03 Parts.

For it's thus: As 12 is to 19; ſo is 11 to 17.4. Then ſay, as 12 is to 17.4; ſo is 20, to Feet 29.03 Parts, the Content required.

Example 10. A Stone 20 Inches broad, 13 Inches deep, and Feet 15 $\frac{1}{4}$ or 15 $\frac{25}{100}$ Feet in Length: How much is the Content? *Anſwer*, Feet 27.5.

For it's, As 12, is to 20; ſo is 13, to 21.67. And then, As 12, is to 21.67; ſo is 15.25, to 27.5, that is, 27 $\frac{1}{2}$ Feet is the Content.

Example 11. A ſquar'd Piece of Timber, Feet 1.25 broad, Feet 0.56 deep, and 36 Feet long; how much is the Content? *Anſwer*, Feet 25.20 Parts, or 25 $\frac{2}{10}$ Feet. For it is,

As 1, is to 1.25; ſo is 0.56, to 0.7: And then ſay, As 1, is to 0.7; ſo is 36 to Feet 25.2 Tenths, the Content required.

PROB. VI. *The Diameter of a Cylinder being given, to find how much in Length will make a Foot Solid?*

1. If the Diameter be given in Inches, the Proportion is thus: As the given Diameter is to 13.531; ſo is 12, to a fourth Number; and ſo is that fourth Number, to the Length required to make a Foot Solid.

2. When the Diameter is given in Foot Meaſure, the Proportion is thus: As the given Diameter is to 1.128; ſo is 1, to a fourth Number; and ſo is that fourth Number to the Length, which will make a Foot Solid.

Example 12. A round Piece of Timber, or Stone, being 15 Inches Diameter; how much in Length will make a Foot Solid? *Anſwer*, Inches 9.76 Parts of an Inch. For it's,

As 15, is to 13.531; ſo is 12, to 10.82; and ſo is 10.82, to Inches 9.76 Parts, or 9 $\frac{76}{100}$ Inches: But ſuppoſing the Diameter of the ſame to be taken in Foot-Meaſure, then it is Foot 1.25 Parts; and how much will make a Foot Solid? *Anſwer*, Foot 0.81 Parts of a Foot.

For it's thus: As 1.25, is to 1.28; ſo is 1, to 0.902; and ſo is 0.902, to Foot 0.815 Parts, or $\frac{815}{1000}$ Foot, to make a Solid Foot.

PROB. VII. *The Circumference of a Cylinder being given, to find how much in Length will make a Foot Solid?*

1. WHEN the Circumference is given in Inches, the Proportion is;

As the Circumference, is to 42.54; ſo is 12, to a fourth Number; and ſo is that fourth Number, to the Length required, to make a Foot Solid.

2. But if the Circumference be given in Foot-Meaſure, then the Proportion is;

As the Circumference, is to 3.545; ſo is 1, to a fourth Number; and ſo is that fourth Number, to the Length, to make a Foot Solid.

Example 13. If a round Stone or Tree, be 44 Inches about; how much in Length will make a Foot? *Anſwer*, Inches 11.22 Parts. For it is,

As 44, is to 42.54; ſo is 12, to 11.6; and ſo is 11.6, to Inches 11.22 Parts of an Inch, or $11\frac{22}{100}$ Inches.

But ſuppoſe the ſame was meaſured by Foot-Meaſure, and the Circumference found to be Feet 3.67 Parts; how much in Length will make a Foot? *Anſwer*, Foot 0.933 Parts. For it's thus;

As 3.67, is to 3.545; ſo is 1, to 0.966; and ſo is 0.966 to Foot 0.933 Parts, or $\frac{933}{1000}$ Foot.

PROB. VIII. *The Diameter and Length of a Cylinder given, to find its Solid Content.*

1. WHEN the Diameter is given in Inches, and Length in Feet, the Proportion is thus,

As 13.531, is to the Diameter; ſo is the Length, to a fourth Number; and ſo is that fourth Number, to the Solid Content in Feet.

2. If the Diameter in Length are both given in Foot-Meaſure, then the Proportion is thus;

As 1.128, is to the Diameter; ſo is the Length, to a fourth Number; and ſo is that fourth Number, to the Content required.

Example 14. A round Piece of Timber 10 Inches thro' and 30 Feet long; how many Feet of Timber are in it? *Anſwer*, Feet 16.38 Parts. For it's, as 13.531, is to 10: ſo is 30, to 22.16; and ſo is 22.16, to Feet 16.38 Parts of a Foot, or 16 $\frac{38}{100}$ Feet.

But ſuppoſe the ſame Piece, meaſured by Foot-Meaſure, then it's Feet 0.83 Parts through, and the Work is thus:

As 1.128, is to 83 or 0.83; ſo is 30, to 22.16; and ſo is 22.16, to Feet 16.38 Parts, or 16 $\frac{38}{100}$ Feet as before.

PROB. IX. *The Circumference and Length of a Cylinder, given; to find the Solid Content?*

1. IF the Circumference be given in Inches, and the Length in Feet, the Proportion is thus: As 42.54, is to the Circumference; ſo is the Length to a fourth Number; and ſo is this fourth Number, to the Solid Content in Feet.

2. When the Circumference and Length are both given in Foot-Meaſure, the firſt Term being 3.545 (inſtead of 42.54) the former Words will ſerve.

Example 15. A round Stone, or Tree, being 30 Inches about, and 25 Feet long; how many Feet Solid are in it? *Anſwer*, Feet 12.43 Parts. For it's thus, As 42.54, is to 30; ſo is 25, to 17.63? and ſo is 17.63, to Feet 12.43 Parts, to 12 $\frac{43}{100}$ Feet.

Now the Compaſs about being taken in Foot-Meaſure is Feet 2.50 Parts; And the Proportition is, As 3.545, is to 2.50; ſo is 25, to 17.63; and ſo is 17.63, to Feet 12.43 Parts, to 12 $\frac{43}{100}$ Feet, as before.

Note 1. When Timber tapers, that is, bigger at one End than the other, it's uſual to take the Breadth and Depth in the Middle of its Length, and by them to meaſure the Piece as if both Ends were of a Bigneſs.

Note 2. The Proportions for Foot-Meaſure, are the ſame when all the Dimenſions are taken in Inches; only the Solid Content found, is Inches.

Note 3. The Solid Content in Inches divided by 1728, the Quotient is Feet; but if divided by 282, or 23 , the firſt is Beer, and the latter is Wine Gallons: And how to divide by the Line of Numbers was ſhewn in Problem IV. of the firſt Uſes of the Gunter, in Page 181.

PROB. X. *The Diameter of a Caſk at the Head and Bung, and alſo its Length being given in Inches; to find its Content in Gallons, Beer, or Wine.*

The RULE is thus:

1. AS 1, is to 0.7; ſo is the Difference of the Bung and Head Diameters, to a fourth Number; which being added to the Head Diameter, the Sum is a Mean Diameter, reducing the Caſk to a Cylinder. Then ſay,

2. As the Gauge Point, (which for Beer or Ale is 18.95, but for Wine is 17.15) is to the Mean Diameter; ſo is the Length, to a fourth Number; and ſo is this fourth Number, to the Content in Gallons required.

Example 16. Suppoſe a Caſk whoſe Length is 40 }
The Diameter at the - - - - - - { Bung 28 } Inch.
{ Head 20 }
What's the Content of this Caſk in Gallons, Beer or Wine?

Anſwer, 73 Gallons Beer, and Wine Gallons 89.1 Tenth. See the following Work.

Bung Diameter - - - - - - - - 28 Inches
Head Diameter - - - - - - - - 20 Inches

Their Difference - - - - - - - 8 Inches

Then, As 1, to 0.7; ſo is 8, to 5.6; which added to 20, the Head Diameter, makes 25.6 for the Mean Diameter: Then ſay,

As

$$\text{As}\left\{\begin{matrix}18.95\\17.15\end{matrix}\right\}\text{ is to }25.6\text{, ſo is }40\text{, to}\left\{\begin{matrix}54\\59.71\end{matrix}\right\}\text{and ſo is}$$

$$\left\{\begin{matrix}54\\59.71\end{matrix}\right\}\text{to}\left\{\begin{matrix}73 & \text{Beer}\\89.12 & \text{Wine}\end{matrix}\right\}\text{Gallons.}$$

1. By *Gunter* with Compaſſes.

1. The Extent from 1 to 0.7, will reach the ſame Way from 8 to 5.6; which being added to 20, the Head Diameter) makes 25.6 for the Mean Diameter. Then,

2. The Extent from 18.95 (the Gauge Point for Beer) to 25.6, will reach from 40 to 54; and that Extent turned over again reaches to 73, the Content in Beer Gallons.

In like Manner the Extent from 17.15 (the Gauge Point for Wine) to 25.6, being laid twice from 40, will reach to 89.12, the Wine Gallons.

2. By the *Sliding Gunter.*

1. Set 1 againſt 0.7, and againſt 8 on the Firſt, is 5.6 on the Second; which added to 20 (the Head Diameter) makes 25.6 for the Mean Diameter. Then,

2. Set 18.95 (the Gauge Point for Beer) on the Firſt, againſt 25.6 on the Second; then againſt 40 on the Firſt, is 54 on the Second; then againſt 54 on the Firſt, is 73 on the Second, the Content in Beer Gallons.

Alſo, if you ſet the Gauge Point for Wine 17.15, againſt the Mean Diameter 25.6, then againſt the Length of the Caſk 40 on the Firſt, you will find 59.71 on the Second; and againſt 59.71 on the Firſt, you'll find on the Second 89.12, the Content in Wine Gallons.

PROB. XI. *The Length of a Ship's Keel, and Breadth at the Beam being given, to find her Tunnage?*

IT is the Practice of Shipwrights about *London*, to multiply the Length of the Keel, Breadth and Half-breadth at the Beam, into one another, and to divide the laſt Product by 94, whoſe Quotient they count for the Ship's Tunnage; from whence I frame this Proportion following, to be wrought by the Line of Numbers.

1. As 188, is to the Breadth; ſo is the Breadth, to a fourth Number: Then ſay,

2. As 1, is to that fourth Number; ſo is the Length, to the Tunnage required.

Example 17. Suppoſe a Ship 72 Feet by the Keel, and 24 Feet by the Beam: I demand her Tunnage? *Anſwer*, Tuns 220.6 Tenths neareſt. See the Work following.

As 188, is to 24; ſo is 24, to 3.06: And then,
As 1, is to 3.06; ſo is 72, to Tuns 220.6 Tenths.

1. By the *Gunter* with Compaſſes.

1. The Extent from the given Number 188, to the Breadth of the Beam 24, will reach from (the ſaid Breadth) 24, to 3.06. Then,

2. The Extent from 1 to 3.06 will reach from the Length of the Keel 72, to Tuns 220.6 Tenths, the Tunnage required.

Or more briefly thus: The Extent from 13.71, (which is the Square Root of the given Number 188) to the Breadth of the Beam 24; being turned over twice from the Length of the Keel 72, reacheth to Tuns 220.6 Tenths, as before.

2. By the *Sliding Gunter*, thus;

1. Set the given Number 188, againſt the Breadth of the Ship 24, and againſt the ſaid Breadth 24 on the Firſt, is 3.06 on the ſecond. Then,

2. Set 1 againſt 30.6, and againſt the Length of the Keel 72 on the Firſt, is Tuns 220.06 Tenths on the Second, as before.

PROB. XII. *To find the Tunnage of a Box, Bale or Caſe, having its Length, Breadth, and Depth given.*

The RULE is this;

1. AS 66, is to the Breadth; ſo is the Depth, to a fourth Number. Then,

2. As 1, is to that fourth Number; ſo is the Length, to its Tunnage required.

Example 18. A Caſe or Bale being 6 Feet broad, 4 Feet deep, and 10 Feet long, I demand its Tunnage? *Anſwer*, Tuns 3.63 Parts. For it's thus;

1. By *Gunter's Scale*, with Compaſſes.

1. The Extent from the given Number 66, to the Breadth 6, reacheth from the Depth 4 to 0.363. Then,

2. The Extent from 1 to the laſt found Number 0.363, being laid from the Length 10, reacheth to 3.63; that is, 3 Tun, and 63 Parts of 100, or $\frac{63}{100}$, Tuns.

2. By the *Sliding Gunter*, thus;

1. Set the given Number 66, againſt the Breadth of the Bale or Caſe 6; then againſt the Depth of it 4 on the firſt, you will find 0.363 on the ſecond, a fourth proportional Number. Then,

2. Set 1 againſt the ſaid Proportional Number 0.363; then againſt the Length of the Bale or Caſe 10 on the firſt, you will find, on the ſecond, 3.63, or 3 $\frac{63}{100}$ the Tunnage of the Bale or Caſe propoſed.

Note; That 66 Feet is the Content of a Caſe that will incloſe two *Engliſh* Butts, but the Cantlings of them are better than a third Part; therefore allowing 26 Feet for the Cantlings, the remaining 40 Feet are counted 1 Tun. And then the Rule is,

1. By the *Gunter* with Compaſſes for the foreſaid *Examp.*

1. The Extent from the given Number 40, to the Breadth of the Caſe or Bale 6, which reach from the Depth 4 to 0.6 a fourth Proportional Number. Then,

2. The Extent from 1, to the ſaid fourth Number 0.6 will reach the ſame Way, from the Length 10, to 6 Tuns, the Content of the Caſe or Bale required.

2. By the *Sliding Gnnter*, thus;

1. Set the given Number 40, againſt the Breadth of the Bale or Caſe 6, then againſt the Depth of it 4, on the Firſt, you will find 0.6 on the Second, a fourth Proportional Number. Then,

2. Set 1 againſt the ſaid Proportional Number 0.6, and againſt the Length of the Bale or Caſe 10 on the Firſt,

you will find on the Second 6, the Tunnage of the Bale or Caſe propoſed.

PROB. XIII. *The Diameter of a Globe being given, to find the Solid Content?*

The RULE.

As 1, is to the Diameter; ſo is 0.5236, to a fourth Number; and ſo is that fourth Number to a fifth; as ſo is this fifth, to its Solid Content required.

Example 19. A Globe whoſe Diameter is 8 Inches; what's the Solid Content? *Anſwer*, Inches 268. For it's wrought thus:

As 1, is to 8; ſo is 2.5236; to 4.19; and ſo is 4.19 to 33.5; and ſo is 33.5, to 268 Inches, the Solid Content of the Globe.

IV. *The Uſe of the Line of Numbers in Gunnery.*

PROB. I. *The Diameter and Weight of any Piece of Ordnance being known; to find the Weight of any other, being of the ſame Metal and Shape, its Diameter being known.*

Like Solids are in Proportion, as the Cubes of their homologous Sides. Therefore the Rule is thus:

As the Diameter of the known Gun is to the Diameter of the Gun whoſe Weight is required; ſo is the Weight of the known Gun to a fourth Number; and ſo is that fourth to a fifth; and ſo is that fifth to the Weight required.

Example 1. Suppoſe a Braſs Saker, whoſe Diameter is Inches 11.5 Tenths, weighs 1900 Pounds; what will a Braſs Gun weigh, whoſe Diameter is Inches 8.75 Parts? *Anſwer*, 837.5 Pounds. For it's thus:

1. By *Gunter*'s Scale with Compaſſes.

The Extent from the Diameter 11.5, to the Diameter 8.75; being laid three Times from the Weight 1900, will reach to 837.5 Pounds, the Weight of the Gun required. And,

2. By the *Sliding Gunter*.

Set the Diameter 11.5, againſt the Diameter 8.75; then againſt the Weight 1900 on the Firſt, is 1445 on the Second ; and againſt 1445 on the Firſt, is 1100 on the Second ; Alſo againſt 1100 on the Firſt, is 837.5 Pounds, the Weight required, on the Second.

PROB. II. *Having the Diameter and Weight of one Piece of Ordnance, and the Diameter of another Piece of another Metal ; to find the Weight of the laſt, it being of the ſame Shape with the former.*

The RULE is thus ;

1. FIND the Weight of the Piece as if it had been of the ſame Metal as the propounded Piece, by the laſt Problem, in Page 204. Then,

2. Conſider the Proportional Weights of Metals, which are known by the following Table of ſpecific Gravity, eſtimated from the lateſt, and moſt approved Experiments.

Caſt Lead is to	Caſt Braſs	as 11.26 is to	8.208
	Caſt Iron		7.135
	Marble		2.7
	Flint Stone		2.621

Caſt Iron is to	Caſt Braſs	as 7.135 is to	8.208
	Marble		2.7
	Flint Stone		2.621

The ſpecific Gravity of *Engliſh* Pebble is 2.696, which is heavier than Flint Stone, and very near the Weight of Marble ; Pebble Stone is 2.601 ; *Portland* Stone 2.57, and Common Stone is 2.5.

3. Having the Weights of both Pieces in one Sort of Metal, you muſt then proportion their Weight according to their different Metals, by the proportional Numbers of thoſe Metals, and than 'tis done.

Example 2. If a Braſs Saker of Inches 11.5 Tenths Diameter, weigh 1900 Pounds ; What will an Iron Gun (of the ſame Shape) weigh, whoſe Diameter is Inches 8.75 Parts ? *Anſwer*, 728 Pounds. For it's wrought thus :

1. I find by Prob. I. in Page 204, that a Braſs Piece of Inches 8.75 Parts Diameter, will weigh 837.5 Pounds ; but becauſe this Piece is Iron, and the Proportion of Braſs to Iron (as aboveſaid) is as 8.208 is to 7.135 ; therefore ſay,

2. As 8.208, is to 7.135; ſo is 837.5, to 728 Pounds, Weight of the Iron Gun required.

PROB. III. *By knowing the Allowance of Powder for one Gun; to find how much of the ſame Powder is requiſite for another Gun?*

The RULE.

As the Diameter of the Bore of the Gun, whoſe Allowance is known, is to the Diameter of the Gun whoſe Allowance is required; ſo is the Allowance given, to a fourth Number; and ſo is that 4th, to a 5th; and ſo is the 5th, to the Allowance required.

But note; Here it's underſtood that both Guns are alike fortified; that is, they ſhall have the ſame Proportion in Weight and Thickneſs of Metal.

Example 3. If a Saker of Inches 3.5 Tenths Bore require 4 Pounds of Powder; what will a Demi-Cannon of Inches 6.5 Tenths Bore require? *Anſwer*, Pounds 25.62 Parts. For it's thus:

As 3.5, is to 6.5; ſo is 4, to 7.44; and ſo is 7.44, to 13.80; and ſo is 13.80, to Pounds 25.62 Parts, the Weight of Powder for the Demi-Cannon, in Proportion to the given Saker. But ſuppoſe the Weight of the Saker 1600, and the Weight of the Demi-Cannon 6000; what Allowance of Powder muſt it then have?

1. By Problem I. Find the Weight of the Demi-Cannon in Proportion to the Saker's Weight, which is thus:

1. As 3.5, is to 6.5; ſo is 1600, to 2971; and ſo is 2971, to 5517; and ſo is 5517, to 10246 Pounds, the Weight of the Demi-Canon, requiring Pounds 25.62 Parts of Powder for its Loading. But ſeeing its Weight is ſuppoſed to be 6000; ſay,

2. As 10246, is to 6000; ſo is 25.62, to Pounds 15, the due Allowance of Powder for the Demi-Canon of Inches 6.5 Tenths Bore, weighing 6000 Pounds; at the Rate of a Saker Inches 3.5 Tenths Bore, weighing 1600 Pounds, and requiring 4 Pounds of Powder.

PROB. IV. *Having the Diameter and Weight of one Bullet, and the Diameter of another of the ſame Metal given; to find the Weight of the latter.*

The RULE.

THE Weight of Bullets (of the ſame Metal) are in Triplicate Proportion of their Diameters, and wrought by the Directions in Problem X. of the firſt Uſes of the *Gunter*, in Pages 188 and 189.

Example IV. If an Iron Bullet 4 Inches Diameter, weigh 9 Pounds; what will an Iron Bullet of 6 Inches Diameter weigh? *Anſwer*, Pounds 30.375 Parts. For it's thus;

As 4, is to 6; ſo is 9, to 13.5; and ſo is 13.5, to 20.25; and ſo is 20.25, to Pounds 30.375 Parts.

PROB. V. *Two Bullets, equal in Diameter, but of different Metals; by the Diameter and Weight of one, to find the Weight of the other.*

The RULE.

1. AS the Proportion of one Metal is to the other, ſo is the Weight of the given Bullet to the Weight of the Bullet required.

Example 5. Suppoſe an Iron Bullet 6 Inches Diameter, weigh Pounds 30.375 Parts; what will a Flint Stone Bullet of the ſame Diemeter weigh? *Anſwer*, Pounds 11.158 Parts. For it's wrought thus:

By Problem II. of Gunnery, (in Page 205) the Proportion of Iron to Flint Stone, is as 7.135 is to 2.621; therefore ſay,

As 7.135, is to 2.621; ſo is 30.375, to Pounds 11.158 Parts of the Weight of the Stone Bullet.

PROB. VI. *Having the Diameter and Weight of a Bullet of one Kind of Metal, and the Diameter of any Bullet of any other Metal given; to find the Weight of the latter.*

The RULE.

1. FIND the Weight of it (by Problem IV.) as if it was the ſame Metal.

2. Then find its Weight according to the Proportion of the Metals by the laſt *Problem*, and it's done.

Example 6. If an Iron Bullet 4 Inches Diameter, weigh 9 Pounds; what is the Weight of a leaden Bullet 6 Inches Diameter? *Anſwer*, Pounds 47.93 Parts. For it's thus wrought;

1. As 4, is to 6; ſo is 9, to 13.5; and ſo is 13.5, to 20.25; and ſo is 20.25, to Pounds 30.375 Parts, if it had been Iron; but as it is Lead, ſay,

2. As 7.135, is to 11.26; ſo is 30.375, to Pounds 47.93 Parts, the Weight being Lead.

V. *The Uſe of* Gunter's Scale *in* Navigation; *and firſt in* Plane Sailing.

CASE I.

The Courſe and Diſtance ſailed being given; to find the Difference of Latitude and Departure from the Meridian?

To do this, the Proportions are theſe:

AS Radius is to the Diſtance; ſo is the Sine of the Courſe to the Departure from the Meridian.

2. As Radius is to the Diſtance; ſo is the Sine Complement of the Courſe to the Difference of Latitude.

Note; The Radius, according to the Nature of the Proportion, may be any of theſe

8. Points

8 Points	on the Line of	Sine Rumbs.
4 Points		Tangent Rumbs.
90 Degrees		Sines.
45 Degrees		Tangents.

And for Conveniency, that each Proportion may ſtand in one Line.

Let S.	ſtand for	Sine
S. c.		Sine Complement
T.		Tangent
T.c.		Tangent Complement
Crs.		Courſe
Diſt.		Diſtance ſailed
Diff. Lat.		Difference of Latitude
Dep.		Departure from the Meridan

Example. If a Ship ſails SW. by S. 104 Minutes from Latitude 1d. 45m. North; I demand what Latitude ſhe is in, and her Departure from the Meridian?

As S.8P. is to 104 M. ſo is S $\left\{\begin{matrix}3\\5\end{matrix}\right\}$ Points to $\left\{\begin{matrix}\text{Dep. 58M}\\\text{Diff.Lat86M}\end{matrix}\right.$

1. By the *Gunter* with *Compaſſes.*

The Extent from 8 Points (on the Line of Sine Rumbs) to 104 Min. (on the Line of Numbers) will reach the ſame Way from 3 Points (on the Line of Sine Rumbs) to 58m. (on the Line of Numbers) which is the Departure from the Meridian; and the Compaſſes kept at the ſame Diſtance, will reach (the ſame Way) from 5 Points (on the Line of Sine Rumbs) to 86 Minutes (on the Line of Numbers) which is the Difference of Latitude.

Note; The Courſe is 3 Points, becauſe SW. by S. is 3 Points from the Meridian or South; and 5 Points is the Complement of the Courſe, becauſe SW. by S. is 5 Points from the Parallel or Weſt: Underſtand the like in any other Courſe

By the *ſliding Gunter.*

Slide 104 min. on the middle Piece, againſt 8 Points, on the Line of Sine Rumbs, on the lower outſide Piece: then againſt 3 Points on the firſt, is 58 Minutes on the ſecond, the Departure from the Meridian; and againſt 5 Points, on the firſt, is 86 Minutes on the ſecond, the Difference of Latitude.

	D.		M.	
Latitude ſailed from - - - - - - - - - - - -	01	:	45	North
Difference of Latitude 86 Minutes or -	01	:	26	South
Subtract, gives the Latitude required - -	00	:	19	North

CASE II.

Courſe and Difference of Latitude given, to find the Diſtance ſailed, and Departure from the Meridian.

To do this, the Proportions are theſe;

1. As the Sine Comp. of the Courſe, is to the Difference of Latitude; ſo is Radius to the Diſtance Run.

2. As the Sine Complement of the Courſe, is to the Difference of Longitude; ſo is the Sine of the Courſe, to the Departure from the Meridian.

Example. Suppoſe a Ship ſails N.N.E. from the Latitude of 2d. 15m. South, and then by Obſervation, is in Latitude 1d. 22m. North, what is her Diſtance ſailed, and Departure from the Meridian?

	D.		M.	
Latitude ſail'd from - - - - - - - - - - - -	02	:	15	South
Latitude by Obſervation - - - - - - - - -	01	:	22	North

Added, gives the Difference of Latitude 03 : 37 which reduced into Minutes by multiplying by 60, is 217 Minutes. Then;

As S. 6 Pts. is to 217 M. ſo is S. $\left\{\begin{matrix}8\\2\end{matrix}\right\}$ Pts. to $\left\{\begin{matrix}235\text{ the Diſt.}\\90\text{ the Dep.}\end{matrix}\right.$

CASE III.

Courſe and Departure from the Meridian given; to find the Diſtance Run, and the Difference of Latitude.

This is performed by theſe Proportions.

1. As the Sine of the Courſe, is to the Departure from the Meridian; ſo is Radius, to the Diſtance ſailed.

2. As the Sine of the Courſe, is to the Departure from the Meridian; ſo is the Sine Complement of the Courſe to the Difference of Latitude.

Example. If a Ship ſails SE. by E. from 1d. 10m. North Latitude, till her Departure be 92 Minutes: What is her Diſtance ſailed, and Latitude ſhe is in?

As S. 5 Pts. is to 92 M. ſo is S. $\left\{\begin{matrix}8\\3\end{matrix}\right\}$ Pts. to $\left\{\begin{matrix}110\ \text{Diſt.}\\61\ \text{Diff. L.}\end{matrix}\right.$

D. M.
Latitude ſailed from - - - - - - - - - - - 01 : 10 North.
Difference of Latitude 61 Minutes, or - 01 : 01 South.

Subtract, gives the Latitude the Ship is in 00 : 09 North.

CASE IV.

Diſtance Run, and Difference of Latitude given, to find the Courſe, and Departure from the Meridian?

Theſe Proportions are theſe;

1. AS the Diſtance ſailed, is to Radius; ſo is the Difference of Latitude, to the Sine Complement of the Courſe.

2. As the Radius, is to the Diſtance ſailed; ſo is the Sine f the Courſe, to the Departure from the Meridian.

Example. Admit a Ship ſails between the S. and W. 8 Leag. from the *Lizard*, in 49d. 57m. North Latitude; nd then by Obſervation, is in 46d. 27m. North Latitude, What is her Courſe and Departure from the Meridian?

d. m.
Latitude ſailed from - - - - - - - - - 49 : 57 North
Latitude by Obſervation - - - - - 46 : 27 North

The Difference of Latitude - - - 03 : 30 or 70 Leag.

1. As 98 Leagues, is to Sine of 90 Degrees; ſo is 70 Leagues, to Sine 45d. 30m. whoſe Complement 44d. 30m. is the Courſe from the South Weſtward; that is, South Weſt, neareſt. Then,

2. As Sine 90 Degrees, is to 98 Leagues; ſo is Sine 44d. 30m. to 68.4 Leagues, the Departure from the Meridian.

1. *By* Gunter *with* Compaſſes.

1. The Extent from 98 Leag. on the Line of Numbers, to 90 Degrees, on the Line of Sines; will reach the ſame Way from 70 Leag. on the Line of Numbers, to 45 deg. 30 min. on the Line of Sines; which being ſubtracted from 90 deg. leaves 44d. 30m. for the Courſe.

2. The Extent from 90 Degrees, on the Line of Sines, to 98 Leagues, on the Line of Numbers, will reach from 44d. 30m. on the Line of Sines, to 68.4 Leagues, on the Line of Numbers, which is the Departure from the Meridian

2. *By the* Sliding Gunter.

1. Bring 98 Leagues, on the Line of Numbers on the middle Piece, againſt 90 Degrees on the Line of Sines, on the out-ſide Piece; then right againſt 70 Leag. on the Firſt, is 45 deg. 30 min. on the Second, which is the Complement of the Courſe, and ſubtracted from 90 deg. is 44d. 30m. and is near 4 Points from the South towards the Weſt, or South Weſt.

2. And as it now ſtands, againſt 44d. 30m. in the Line of Sines, on the out-ſide Piece, is 68.4 Leagues in the Line of Numbers, on the middle Piece, which is the Departure from the Meridian.

CASE V.

Diſtance Run, and Departure from the Meridian given, to find the Courſe and Difference of Latitude.

Th

The Proportions are as follows;

1. AS the Diſtance ſailed, is to Radius; ſo is the Departure from the Meridian, to the Sine of the Courſe.

2. As Radius is to the Diſtance ſailed; ſo is the Sine Complement of the Courſe, to the Differenco of Latitude.

Example. A Ship ſails 354 Minutes between the South and Eaſt from 1d. 19m. South Latitude, until her Departure from the Meridian be 150 Minutes; what is her Courſe and what Latitude is ſhe in?

1. As 354 Minutes, is to Sine 90d. ſo is 150 Minutes, to Sine 25d. ſo that the Courſe is N. Eaſtward, or NNE. a quarter Eaſt.

2. As S. 90 Degrees, is to 354 Minutes; ſo is Sine 65 Degrees, to 323 Minutes, the Difference of Latitude.

D. M.
Latitude ſailed from is - - - - - - - - - - - 01 : 19 South
The Difference of Lat. 323 Minutes, or 05 : 23 North

Subtract, gives the Latitude the Ship is in 04 : 04 North
So that the Ship hath croſſed the Equator.

CASE VI. *Difference of Latitude, and Departure from the Meridian given; to find the Courſe and Diſtance Run.*

To do this, theſe are the Proportions.

1. AS the Difference of Latitude, is to the Departure from the Meridian; ſo is Radius, to the Tangent of the Courſe.

2. As the Sine of the Courſe, is to the Departure from the Meridian; ſo is Radius, to the Diſtance ſailed.

Example. Sailing between the North and Weſt, from a Port in 1d. 59m. South Latitude, and then arriving at another Port which is in 3d. 8m. North Lat. and is alſo 209 Minutes to the Weſtward of the firſt Port. I demand the Courſe and Diſtance from the firſt Port to the ſecond.

Latitude of the firſt Port - - - - - - - - 1 : 59 South
Latitude of the ſecond Port - - - - - - 3 : 08 North

Added, gives the Difference of Latitude 5 : 07 or 307m.

1. As 307 min. is to 209 min. ſo is Tangent 45 deg. to Tangent 34 deg. 15 min. the Courſe North Weſtward, or NW. by N. neareſt.

2. As S. 34 degrees 15 minutes, is to 209 minutes; ſo is S. 90 degrees, to 370 minutes, the Diſtance between the two Ports.

1. By the *Gunter* with Compaſſes.

1. The Extent from 307 min. to 209 min. on the Line of Numbers, will reach from 45 deg. on the Line of Tangents, (that now being the Radius) to 34 degrees 15 min. on the ſame Line of Tangents, which is the Courſe from Meridian.

Note, When the Difference of Latitude is greateſt, the Courſe is leſs than 45 degrees from the Meridian.

But when the Departure from the Meridian is greateſt, the Courſe is more than 45 degrees from the Meridian.

2. The ſecond Canon or Proportion for the Diſtance Run, is wrought as in the ſecond or third Caſe, in Page 210, 211.

2. By the *Sliding Gunter.*

1. In this Caſe, place the middle Piece in ſuch a Manner, that a Tangent Line may ſlide againſt a Tangent Line, alſo Numbers againſt Numbers: Then bring 307 min. on the Line of Numbers on the middle Piece, againſt 209 min. on the Line of Numbers on the outſide Piece; then againſt 45 degrees, on the Line of Tangents, on the middle Piece, is 34 degrees 15 minutes on the Tangents, on the out-ſide Piece, which is the Courſe required.

2. For the Diſtance, the manner of working is the ſame as hath been ſhewn in Caſes Firſt, Second and Third.

To

To reſolve a Traverſe by *Gunter*'s Scale.

Example 1. A Ship in 40 Degrees North Latitude, and in 5 degrees 14 minutes Weſt Longitude, ſails firſt S.E. by S. 68 minutes, then SW. by W. 55 minutes, and then W.N.W. 75 minutes: I demand the Courſe and Diſtance from the firſt Place of Departure, and what Latitude and Longitude ſhe is in?

To do this, Firſt find the Difference of Latitude, and Departure from the Meridian, for each ſeveral Courſe, as directed in Caſe I. of Plane-Sailing, in Pages 208 and 209.

2. Collect the ſeveral Differences of Latitude into two Sums, *viz.* the Northing into one, and the Southing into another; and in like manner, the ſeveral Departures either Eaſt or Weſt: Taking the Difference of the Northing and Southing, for the Difference of Latitude; and the Difference of the Eaſting and Weſting, for the Departure from the Meridian.

3. Having now the Difference of Latitude, and the Departure from the Meridian known; the Courſe and Diſtance may be found by the Sixth Caſe of Plane Sailing, in Pages 213 and 214.

4. The Difference of Longitude may be found by this Proportion:

As the Sine Complement of the middle Latitude, is to the Departure from the Meridian; ſo is Radius, to the Difference of Longitude. See the Work following.

M. Pts. M.

1. Courſe, As S. 8 Pts. is to 68; ſo is S. { 3, to 37 $\frac{8}{10}$ E.ing
{ 5, to 56 $\frac{5}{10}$ S.ing

2. Courſe, As S. 8 Pts. is to 55; ſo is S. { 5, to 45 $\frac{7}{10}$ W.ing
{ 3, to 30 $\frac{6}{10}$ S.ing

3. Courſe, As S. 8 Pts. is to 75; ſo is S. { 6, to 69 $\frac{3}{10}$ W.ing
{ 2, to 28 $\frac{7}{10}$ N.ing

	Courſes.	Diſt.	Diff. Lat.		Departure.	
			North	South	Eaſt	Weſt
1.	S.E. by S.	68		56.5	37.8	
2.	S.W. by W.	55		30.6		45.7
3.	W.N.W.	75	28.7			69.3
			28.7	87.1	37.8	115.0
				28.7		37.8
		Diff. Lat.		58.4		77.2 Dep.

3. Then; As min. 58.4, is to min. 77.2: ſo is T. 45d. to T. 52d. 54m. the Courſe from the South towards the Weſt, that is, SW. three Quarters W. almoſt. And again,

As S. 52d. 54m. is to min. 77.2; ſo is S. 90d. to 96.8 Minutes, the Diſtance from the firſt Place of Departure.

D. M.
Latitude ſailed from - - - - - - - - - 40 : 00 North.
The Diff. of Latitude min. 58.4 or - 00 : 58 Southerly.

Subtract, gives the Lat. the Ship is in 39 : 02 North.

Therefore the middle Latitude is - - 39 : 31
Subtracted from - - - - - - - - - - - - 90 : 00

Gives Complement of the middle Lat. 50 : 29

4. As S. 50d. 29m. is to m. 77.2; ſo is S. 90d. to 100.1m. the Difference of Longitude.

D. M.
The Longitude ſailed from is - - - 05 : 14 Weſt
The Difference of Long. 100m. or - 01 : 40 Weſt

Added gives the Long. the Ship is in 06 : 54 Weſt

Example 2. A Ship in 41d. 30m. North Latitude, and 10d. 20m. Eaſt Longitude, ſails theſe ſeveral Courſes; and Diſtances, *viz.* S.E. by S. 52 Minutes, then S.S.W. 63 min.

63 Minutes, E. by N. 47 Minutes, N. by E. half E. 35 Minutes, NNW. a quarter W. 47 Min. WNW. 73 Min. I demand the Courſe and Diſtance from the firſt Place of Departure; alſo the Latitude and Longitude the Ship is in?

1. For the doing of which, obſerve the Work following.

		M.		Points.		M.
1	- - - - - - - - - -	52	- - -	3 5		28.9 E. 43.2 S.
2	- - - - - - - - - -	63	- - -	2 6		24.1 W. 58.2 S.
3	- - - - - - - - - -	47	- - -	7 1		46.1 E. 9.2 N.
	Courſe; as S. 8 Pts. is to	;	ſo is S.		to	
4	- - - - - - - - - -	35	- - -	1 6½		10.2 E. 33.5 N.
5	- - - - - - - - - -	47	- - -	2¼ 5¾		20.1 W. 42.5 N.
6	- - - - - - - - - -	73	- - -	6 2		67.4 W. 27.9 N.

2. Then to collect the ſeveral Northings, Southings, Eaſtings, and Weſtings into one; and here you ſee in the Table following; whereby you will have the Difference of Latitude and Departure from the Meridian.

	Courſes.	Diſt	Diff. Lat.		Departure	
			North	South	Eaſt	Weſt
1.	S. E. by S.	52		43.2	28.9	
2.	S. S. W.	63		58.2		24.1
3.	Eaſt by North	47	9.2		46.1	
4.	N. by E. ½ E.	35	33.5		10.2	
5.	N. N. W. ¼ W.	47	42.5			20.1
6.	W. N. W.	73	27.9			67.4
			113.1	101.4	85.2	111.6
			101.4			85.2
	Difference Latitude		11.7	Departure		26.4

3. Now having the Difference of Latitude and Departure from the Meridian know, the Courſe and Diſtance is thus found.

As 11.7 Minutes, is to 26.4 Minutes ; ſo is T. 45d. to T. 66d. 06m. The Courſe North Weſterly, or W.N.W. becauſe the North and Weſt Columns are the greateſt.

Here obſerve the Courſe is more than 45 Degrees from the Meridian, becauſe the Departure is more than the Difference of Latitude ; according to the Note in the 6th Caſe of Plane-Sailing in Page 214. Then for the Diſtance, ſay,

As S. 66d. 06m. is to 26.4 minutes ; ſo is 90 deg. to minutes 28.88 : The Diſtance from the firſt Place of departing.

	D.	M.	
Latitude ſailed from	41	30	North
The Difference of Latitude m. 11.7 or	00	12	North
Added, gives the Lat. the Ship is in	41	42	North
And the middle Latitude is	41	36	
Subtracted from	90	00	
Gives Comp. of middle Latitude	48	24	

4. Then to find the Difference of Longitude, ſay ; As S. 48d. 24m. is to 26.4m. ſo is S. 90d. to 35.31 min. the Difference of Longitude.

	D.	M.	
The Longitude ſailed from is	10	20	Eaſt
The Difference of Longitude 35.31 min or	00	35	Weſt
Subtract, gives the Logit. the Ship is in	09	45	Eaſt

Secondly

Secondly, The Uſe of Gunter's-Scale *in* Mercator's Sailing.

CASE I.

The Latitude and Longitude of two Places given; to find the Courſe and Diſtance between them.

Example. I demand the Courſe and Diſtance from the *Lizard* to *Barbadoes?* Latitudes and Longitudes of thoſe Places being ſuppoſed as follows:

		d.	m.			d.	m.	
Lizard	Lat.	49	57	North	Longit.	5	14	W.
Barbadoes		12	58	North		58	50	W.
The Diff. of Lat.		36	59	South, Diff. Long.		53	36	W.
		60				60		
Minutes		2219		Minutes		3216		

To anſwer this Queſtion, the Proportions are theſe,

1. As the Meridional Difference of Latitude, is to the Difference of Longitude; ſo is Radius, to the Tangent of the Courſe.

2. As the Sine Complement of the Courſe, is to the Difference of Latitude; ſo is Radius, to the Diſtance of the two Places.

The Meridional Difference of Latitude is thus found: Extend the Compaſſes on the Meridional Line, from one Latitude to the other; that Extent meaſured on the Equinoctial Line (the next Line adjoining to the Meridional Line marked EP.) gives the Meridional Difference of Latitude.

Thus, the Extent from Latitude 49d. 57m. to Latitude 12d. 58m. on the firſt, being meaſured on the latter, is deg. $44\frac{75}{100}$ or 44d. 45m. or 2685 minutes, the Meridional Difference of Latitude: Then ſay;

As 2658 M. is to 3216 M.
Or, As 44d. $\frac{75}{00}$ is to 53d. $\frac{6}{10}$ } So is T. 45d. to T. 50d. 09m.
the Courſe from the South Weſtward, or S. W. 5 degrees 9 minutes Weſterly. And again:

As S. 39d. 51m. is to 2219m. ſo is S. 90d. to 3463m. Or, as S. 39d. 51m. is to 36d. $\frac{983}{1000}$, ſo is Sine 90d. to 57d. $\frac{72}{100}$ or 57d. 43m. equal to 3463 Minutes.

CASE II.

Both Latitudes and Courſe given; to find the Diſtance and Difference of Longitude.

The Proportions are theſe:

1. AS the Sine Complement of the Courſe, is to the Difference of Latitude, *&c.* as before in the Second Caſe of Plane Sailing, to find the Diſtance and Departure from the Meridian, in Page 210.

2. As the Sine Complement of the middle Latitude, is to the Departure from the Meridian; ſo is Radius to the Difference of Longitude.

Or thus; as the Sine Complement of the Courſe, is to the Meridional Difference of Latitude, ſo is the Sine of the Courſe, to the Difference of Longitude.

Example. Admit from the *Lizard* in 49 deg. 57 min. North Latitude, and Longitude 5d. 14m. Weſt, we made (when Leeway, Variation, *&c.* allowed for) our Courſe to be South 39 deg. Weſterly; and then by Obſervation was in 44d. 58m. North Latitude. I demand her Diſtance Run, and what Longitude ſhe is in?

Latitude ſailed from - - - - - - 49d. 57m. North.
Latitude by Obſervation - - - 44d. 58m. North.

Subtract, is the Diff. of Latitude 04d. 59m. Southerly.
60

Minutes 299
The Middle Latitude is - - - 47d. 27m.
Subtract from - - - - - - - - - - 90d. 00m.

Compl. of the Middle Latitude 42d. 33m.

1. As S. 51d. is to 299m. ſo is S. $\left\{\begin{matrix}90\\39\end{matrix}\right\}$d. to $\left\{\begin{matrix}385\text{ Diſtance}\\242\text{ Depart.}\end{matrix}\right.$

2. As 42d. 33m. is to 242 Minutes; ſo is S. 90d. to 358 Minutes, the Difference of Longitude. Or thus, The Extent from 49d. 57m. on the Meridian Line, to 44d. 58m. meaſured on the Line of Equal Parts, is 7d. $\frac{4}{10}$ or 7d. 24m. or 444 Minutes, for the Meridional Difference of Latitude: Then,

As 51d. is to 444 Minutes; ſo is S. 39d. to 358m. Or thus;

As 299 Minutes, is to 242 Minutes; ſo is 444 Minutes to 358 Minutes as before, which is the Difference of Longitude.

d. m.
The Longitude ſailed from - - - - - - - - - 05 : 14 Weſt
The Difference of Longitude 358 min. or 05 : 58 Weſt

Added, gives the Longitude the Ship is in 11 : 12 Weſt

CASE III.

Both Latitudes and Diſtance Run given; to find the Courſe and Difference of Longitude.

To perform this, the Proportions are theſe;

1. AS the Diſtance ſailed is to Radius; ſo is the Difference of Latitude to the Sine Complement of the Courſe, as in the Fourth Caſe of Plane Sailing, in Page 211, by which Caſe alſo you may find the Departure from the Meridian, or Meridian Diſtance.

2. As the Sine Complement of the middle Latitude, is to the Departure; ſo is the Radius, to the Difference of Longitude. Or thus;

As the Difference of Latitude, is to the Departure from the Meridian; ſo is the Meridional Difference of Latitude to the Difference of Longitude.

Example. A Ship in 46d. South Latitude, and 1d. 15m. Weſt Longitude, ſails 100 Leagues North Eaſtward, and then by Obſervation is in Lat. 42d. South: I demand her Courſe, Departure from the Meridian, and the Longitude ſhe is in?

Latitude ſail'd from is - - - - - 46d. South.
Latitude by Obſervation is - - 42d. South.

Subtract, gives the Diff. Lat. 4d. or 80 Leagues.

The middle Latitude is - - - 44d. whoſe Comp. is 46d.

1. As 100 Leag. is to S. 90d. ſo is 80 Leagues, to S. 53 deg. 15 min. the Complement of the Courſe; ſo that the Courſe is 36 deg. 45 min. North Eaſtward, or N.E. by N. a quarter E. And then again.

As S. 90d. is to 100 Leag. ſo is S. 36d. 45m. to 60 Leag. the Departure from the Meridian.

2. As S. 46 deg. is to 60 Leag. ſo is S. 90d. to 83 Leag. the Difference of Longitude, or thus: The Extent from 46d. to 42d. on the Meridional Line, makes 5d. $\frac{5}{10}$ or 110 Leagues on the equal Part, which is the Meridional Diff. of Latitude. And then it's.

As 80 leag. is to 60 leag. ſo is 110 leag. to 83 leag. } diff. long.
Or, as 4d. is to 3d. ſo is 5d. $\frac{5}{10}$ to 4d. $\frac{15}{100}$ }
Longitude ſailed from is - - - - - - - - 1d. : 15m. Weſt.
The Difference of Longitude 83 leag. or 4d. : 09m. Eaſt.

Subtract gives the Longitude Ship is in 2d. : 54m. Eaſt.

CASE

CASE IV.

Both Latitude and Departure from the Meridian given; to find the Courſe, Diſtance Run, and Differ. Long.

1. THE Courſe and Diſtance Run, is found by the Sixth Caſe of Plane-Sailing, in Page 213.

2. The Difference of Longitude is found as in the ſecond, third, or fourth Caſe in *Mercator*.

Example. A Ship in 33 Degrees North Latitude, and 178 Degrees Weſt Longitude, ſails South Weſtward until ſhe has departed from the Meridian 58 Leagues, and then ſhe is in Latitude 28d. 36m. North: I demand her Courſe, Diſtance Run, and what Longitude ſhe is in?

	d.	m.	
Latitude ſailed from - - - - - -	33	00	North
Latitude the Ship is in - - - -	28	36	North
The Difference of Latitude is -	04	24	or 88 Leagues
The middle Latitude is - - - -	30	48	Comp. 59° 12′

1. As 88 Leagues, is to 58 Leagues; ſo is T. 45 deg. to T. 33d. 20m. which is the Courſe South Weſterly, or S.W. by S.

2. As S. 33d. 20m. is to 58 Leagues; ſo is S. 90d. to 105 Leagues, the Diſtance ſailed.

3. The Meridional Difference of Latitude 5 deg. $\frac{15}{100}$ or 5 deg. 9 min. or 103 Leagues, is found as before directed.

4. As $\left\{\begin{array}{c}\text{S. 59d. 12m.}\\ \text{88 Leagues}\end{array}\right\}$ is to 58 leagues $\left\{\begin{array}{c}\text{S. 90 deg.}\\ \text{103 leag}\end{array}\right\}$ to 67 Leagues, the Difference of Longitude.

5. Longitude ſailed from - - - - - - -	178	00	Weſt
The Difference of Longitude 67 leag. or	03	21	Weſt
Added, the Sum is - - - - - - - - - - -	181	21	
Which ſubtract from - - - - - - - - - -	360	00	
Remainder is the Longitude the Ship is in	178	39	Eaſt

CASE V.

One Latitude, Courſe and Diſtance Run given; to find the other Latitude, and Difference of Longitude.

1. THE Difference of Latitude and Departure from the Meridian, is found by the firſt Caſe of Plane Sailing, (in Page 208 and 209) and conſequently the other Latitude.

2. The Difference of Longitude is found as before in the ſecond or third Caſe of *Marcator*.

Example. If a Ship ſails SE. by S. 120 Leagues, from a Port in 53d 30m. North Latitude, and 2d. 15m. Weſt Longitude; what Latitude and Longitude is ſhe in?

As S. 8 Points, is to 120 Leagues; ſo is S. 5 Points, to 100 Leagues, the Difference of Latitude.

And, as S. 8 Points, is to 120 Leagues; ſo is S. 3 Points, to 67 Leagues, the Departure from the Meridian.

D. M.
Latitude ſailed from - - - - - - - - - - - - 53 : 30 North
The Diff. of Latitude 100 Leagues, or - 05 : 00 South

Subtract, gives the Latitude the Ship is in 48 : 30 North

And the middle Latitude is - - - - - - - 51 : Comp. 39d.
The Meridional Diff. Lat. is 8d. or 160 Leagues.

$$\text{As}\left\{\begin{matrix}\text{S. 39d.}\\ \text{100 Leag.}\end{matrix}\right\}\text{ is to 67 Leag. so is }\left\{\begin{matrix}\text{S. 90d.}\\ \text{100 Leag.}\end{matrix}\right\}\text{ to}$$

107 Leagues the Difference of Longitude.

D. M.
Longitude ſailed from is - - - - - - - - - 02 : 15 Weſt
The Diff. Longitude 107 Leagues, or - - 05 : 21 Eaſt

Subtract, gives the Longitude ſhe is in - 03 : 06 Eaſt

So that the Ship hath croſſed the firſt Meridian.

CASE VI.

Sailing in a Parallel, to find the Difference of Longitude.

To do this, the Proportion is thus;

AS the Sine Complement of the (Parallel or) Latitude, is to the Diſtance ſailed Eaſt or Weſt;
So is Radius to the Difference of Longitude.

Example. If a Ship ſails Weſt 390 Minutes, in the Latitude of 50d. 10m. and departs from 2d. 45m. Eaſt Longitude. I demand what Longitude the Ship is now in?

As S. 39d. 50m. is to 390 min. ſo is 90d. to 610 min. the difference of Longitude.

	d.		m.	
Longitude ſailed from, is - - - - - - - -	2	:	45	Eaſt
The Difference of Longit. 610 min. or -	10	:	10	Weſt
Subtract, gives the Longitude the Ship is in	7	:	25	Weſt

CASE VII.

The Diff. of Longitude (of two Places in one Parallel or Latitude) given, to find their Diſtance in that Parallel.

THE Proportion is thus: As Radius is to the Difference of Longitude; ſo is the Sine Complement of the Latitude, to the Diſtance in that Parallel.

Example 1. SuppoſeCape St. *Vincent* in *Portugal*, and Cape *Henry* in *Virginia*, both in 37 deg. North Latitude, and their Longitude as here-under, what is their Diſtance in their Parallel.

		d.		m.	
Cape St. *Vincent*	Longitude	09	:	06	Weſt
Cape *Henry*		75	:	24	Weſt
Subtract gives the Diff. Longit.		66	:	18	or 3987 minutes

Latitude of both Places is nearly - - - 37 deg. North
Subtract from - - - - - - - - - - - - - - - 90
Remains Complement of the Latitude - - 53 degrees

2. As S. 90 degrees, is to S. 53 degrees; ſo is 66 $\frac{3}{10}$ equal to 66d. 18m. to 52d. $\frac{95}{100}$ or 52d. 57m. or 3177m. the Diſtance required. Or thus:

As S. 90 degrees, is to S. 53 degrees; ſo is 3978 Minutes, to 3177m. the Diſtance in the Parallel as above.

Example 2. Suppoſe two Ships under the Equinoctial, 100 Leagues aſunder, and each ſails North till both come into Latitude 60 Degrees. How far are they now aſunder? *Anſwer*, 50 Leagues for it's thus;

As S. 90 degrees; is to S. 30 degrees; ſo is 100 Leagues, to 50 Leagues, the Diſtance required.

CASE VIII.

To find how many Minutes or Miles make a Degree of Longitude in any Parallel of Latitude.

The RULE.

AS Radius, is to the Sine Complement of the Latitude; ſo is 60 min. (a Degree on the Equinoctial,) to the Minutes making a Degree of Longitude in the Parallel deſired.

Example. In the Latitude of 50 deg. I demand how many Minutes of Eaſting and Weſting make a Degree of Longitude? *Anſwer*, 38 $\frac{1}{2}$ Minutes. For it's thus.

As S. 90 deg. is to S. 40 deg. ſo is 60 min. to min. 38.5 or 38 and a half, to make one degree of Longitude in Latitude 50 Degrees.

This may be done by the Plane-Scale, thus:

Take the given Latitude from the Chords, and meaſure it on the Line M.L. (which is Miles of Longitude) ſheweth your deſire: As here, take 50 deg. from the Chords, and meaſure it on the Scale M.L. it ſheweth 38 min. and a half, as before.

VI. *The Uſe of* Gunter's-Scale *in Aſtronomy*.

PROBLEM I. *The Sun's Place in the Ecliptic, and his greateſt Declination given, to find his Right Aſcenſion and preſent Declination.*

To perform this, theſe are the Proportions;

1. AS Radius is to the Sine Complement of the Sun's greateſt Declination; ſo is the Tangent of the Longitude (from the neareſt Equinoctial Point,) to the Tangent of his Right Aſcenſion, from the ſaid Point.

The Names and Characters of the 12 *Signs,*

♈	*Aries*	North Signs	♎	*Libra*	South Signs
♉	*Taurus*		♏	*Scorpio*	
♊	*Gemini*		♐	*Sagittarius*	
♋	*Cancer*		♑	*Capricornus*	
♌	*Leo*		♒	*Aquarius*	
♍	*Virgo*		♓	*Piſces*	

Note 1. The Sun's greateſt Declination is 23 degrees 29 min.

Note 2. The beginning of *Aries* and *Libra* are the two Equinoctial Points.

Note 3. This Proportion (above) finds the Sun's Right Aſcenſion only when he is in the firſt Quarter of the Ecliptic: that is, ♈, ♉, and ♊: But when he is in the ſecond Quarter, ♋, ♌, and ♍, ſubtract it from 180 deg. and when in ♎, ♏, and ♐, add to it 180 deg. And in the laſt Quarter, ♑, ♒, and ♓, ſubtract what's found by this Operation) from 360 deg. ſo will you have the Sun's Right Aſcenſion from ♈ (for any Place in the Ecliptic) deſired.

2. As Radius, is to the Sine of the Sun's Longitude (from the neareſt Equinoctial Point) ſo is the Sine of the Sun's greateſt Declination, to the Sine of his preſent Declination.

Note, The Sun being in ♈, ♉, ♊, ♋, ♌, and ♍, his Declination is North: But ♎, ♏, ♐, ♑, ♒, and ♓, it's South.

Example.

When the Sun's Place in the Ecliptic is in ♉ 24d. 15m. *What is his Right Aſcenſion and Declination?*

The Sun being in ♉, 24 Degrees 15 Minutes, his Longitude from the neareſt Equinoctial Point (being now the beginning of ♈) is 54 degrees 15 minutes. And the Complement of his greateſt Declination is always 66 Degrees 31 Minutes. Then it follows:

1. As S. 90 degrees, is to S. 66 degrees 31 minutes; ſo is Tangent 54 degrees 15 minutes, to Tangent 51 Degrees 52 Minutes, the Sun's RightAſcenſion (from the beginning of ♈) required.

By the *Gunter* with Compaſſes.

The Extent from Sine 90 Degrees, to Sine 66 Degrees 31 Minutes, will reach from Tangent 54 Degrees 15 Minutes, to Tangent 51 Degrees 52 Minutes, the Sun's Right Aſcenſion.

By the *ſliding Gunter*.

1. Let the middle Piece be ſo put in, that Sines may ſlide againſt Sines, and Tangents againſt Tangents.

2. Then bring 90 Degrees in Sines (on the out-ſide Piece) againſt 66 deg. 31 min. in Sines (on the middle Piece) then againſt 54 deg. 15 min. in Tangents (on the middle Piece) is 51 deg. 52 min. in Tangents (on the out-ſide Piece) the Right Aſcenſion, as above.

This Proportion being to be wrought on Sines and Tangents, jointly, I thought it neceſſary to expreſs the manner of its Operation on both Sorts of *Gunters*, that the Learner might ſee how it agrees with the General Rule given at the Beginning of this Diſcourſe of the *Gunter*, in Page 177, and 178; but ſhall wave it in the reſt, and only write the Proportion in Words and in Figures, according to the particular Example, as follows, for the Sun's Declination.

2. As S. 90 Degrees, is to S. 54 deg. 15 min. ſo is S. 23 deg. 29 min. to S. 18 deg. 52 min. the Sun's Declination North, increaſing.

PROBLEM II.

The Latitude of a Place, and the Sun's Declination given; the find his Amplitude, and Aſcenſional Difference; and conſequently his Riſing and Setting; and the Length of the Day and Night.

To perform this Problem, the Proportions are theſe;

1. AS the Sine Complement of the Latitude, is to Radius; ſo is the Sine of the Sun's Declination to the Sine of his Amplitude.

Note, The Amplitude and Declination are always of one kind; that is, both North or both South.

2. As the Tangent Complement of the Latitude, is to the Tangent of the Sun's Declination; ſo is Radius, to the Sine of his Aſcenſional Difference.

Note 1. The Aſcenſional Difference (being reduced into Time, by allowing 15 Degrees for one Hour, and then) added to, and ſubtracted from 6 Hourrs, the one is Sun-riſing, the other Sun-ſetting.

Note 2. If the Latitude and Declination are both North or both South; the Sun riſeth before and ſets after Six of the Clock; but if one be North, and the other South, the contrary.

Note 3. If the Sun's riſing and ſetting be doubled ſeverally, the former is the Length of the Night, and the latter the Length of the Day.

Note 4. By this Problem were the Tables of Amplitudes, and Semidiurnal Arches, &c. in this Book calculated.

Example. Latitude 51 deg. 32 min. North, and the Sun's Declination 23 deg. 29 min. North: I demand his Amplitude, and Aſcenſional Difference: Alſo his Riſing, Setting and Length of the Day and Night.

d. m.

		d.	m.		d.	m.
Anſw. Sun's Amplitude		39	50,	Aſcen. Diff.	33	10
Sun-ſetting	is Hours	8	13,	Leng. of Day	16	26
Sun-riſing		3	47,	Leng. of Night	7	34

For it's thus;

1. As S. 38d. 28m. is to S. 90d. ſo is S. 23 deg. 29 min. to 39 deg. 50 min. the Amplitude North, becauſe the Declination is North, that is, the Sun riſeth Eaſt 39 deg. 50 min. Northerly, and ſetteth Weſt 39d. 50m. Northerly.

2. As T. 38 deg. 28 min. is to T. 23 deg. 29 min. ſo is S. 90 deg. to S. 33 deg. 10 min. the Aſcenſional Difference; which being reduced into Time, is 2 hours 13 minutes; and added to 6 hours, is 8 hours 13 minutes for Sun-ſetting; which doubled, is 16 degrees 26 minutes, the Length of the Day.

Again, 2 hours 13 minutes ſubtracted from 6 hours, is 3 hours 47 minutes for Sun-riſing; which doubled is 7 hours 34 minutes, the Length of the Night.

PROBLEM III.

Latitude of a Place, and the Sun's Declination given; to find his Altitude and Azimuth at Six of the Clock.

To ſolve this, ſay;

1. AS Radius, is to the Sine of the Latitude; ſo is the Sine of the Sun's Declination, to the Sine of his Altitude at Six of the Clock.

2. As Radius, is to the Sine Complement of the Latitude; ſo is the Tangent of the Sun's Declination, to the Tangent of his Azimuth (from the Eaſt or Weſt) at Six of the Clock.

Note, The Azimuth is from the Eaſt, at Six in the Morning; and from the Weſt at Six in the Afternoon; Northerly, in North Latitude; but Southerly, in South Latitude.

Example. In 51d. 32m. North Latitude, the Sun's Declination being 23d. 29m. North. What is his Altitude, and Azimuth at Six of the Clock.

Anſw.

Anſwer, His Altitude is 18d. 11m. and his Azimuth is Eaſt 15d. 7m. Northerly, or 74d. 53m. North Eaſterly, or Weſterly. For it's thus:

1. As 90d. is to S. 51d. 32m. ſo is S. 23d. 29m. to S. 18d. 11m. the Altitude of Six of the Clock.

2. As S. 90d. is to S. 38d. 28m. ſo is T. 23d. 29m. to T. 15d. 07m. the Azimuth at Six; that is 74d. 53m. North Eaſterly at Six in the Morning, but North Weſterly in the Afternoon.

PROBLEM IV.

Latitude of a Place, and the Sun's Declination given; to find his Altitude, and Hour of the Day, when he is Eaſt or Weſt.

To perform this, the Proportions are theſe:

1. AS the Sine of the Latitude, is to Radius; ſo is the Sine of the Sun's Declination, to the Sine of his Altitude, when Eaſt or Weſt.

2. As the Tangent of the Latitude, is to the Tangent of the Sun's Declination; ſo is Radius, to the Sine of the Hour from Six of the Clock, when he is Eaſt or Weſt.

Note 1. The Sun is Eaſt after Six in the Morning, but Weſt before Six in the Afternoon.

Note 2. The Hour found (by the laſt Proportion) being reduced into Time (by allowing 15 deg. to an Hour) and added to, or ſubtracted from 6, gives the Hour of the Day, when the Sun is Eaſt or Weſt.

Example. In 51d. 32m. North Latitude, the Sun's Declination being 23d. 29m. North; what is his Altitude? and what Time of the Day is it, when he is Eaſt or Weſt?

Anſwer, His Altitude is 30d. 35m. and the Hour of the Day is { 7h. 21m. Morning, when Eaſt.
{ 4h. 39m. Afternoon when Weſt.

For it's thus?

1. As S. 51d. 32m. is to S. 90d. ſo is S. 23d. 29m. to S. 30d. 35m. the Sun's Altitude, when either Eaſt or Weſt.

2. As T. 51d. 32m. is to T. 23d. 29m. ſo is S. 90d. to S. 20d. 11m. the Hour from Six, which makes 1 Hour 21 Minutes, added to 6, is 7 h. 21 m. and ſubtracted from 6, is 4 h. 39 m. the former is the Time when the Sun is Eaſt in the Morning; the latter the Time when he is Weſt in the Afternoon.

PROBLEM V.

The Sun in the Equator or Equinoctial, (that is, when he hath no Declination) the Latitude of a Place, and the Sun's Altitude given; to find his Azimuth, and the Hour of the Day.

This Problem is thus performed.

1. AS the Tangent Complement of the Latitude, is to the Tangent of the Sun's Altitude; ſo is Radius to the Sine Complement of his Azimuth from the South in North Latitude; but from the North in South Latitude; Eaſterly, in the Forenoon; and Weſterly in the Afternoon.

2. As the Sine Complement of the Latitude, is to Radius; ſo is the Sine of the Sun's Altitude, to the Sine Complement of the Hour from Noon.

Example. In 51d. 32d. North Latitude, the Sun having no Declination, and his Alt. being 21d. 50m. in the Forenoon; I demand his Azimuth and the Hour of the Day?

Anſwer. His Azimuth is South 59d. 45m. Eaſterly, that is, the Sun is upon the SE. by E. a quarter E. Point of the Compaſs, and the Hour of the Day is Hours 8.27 Minutes Morning. For it's thus:

1. As T. 38d. 28m. is to T. 21d. 50m. ſo is S. 90d. to S. 30d. 15m. whoſe Complement is 59d. 45m. is the Sun's Azimuth required.

1. As S. 38 deg. 28 min. is to S. 90 deg. ſo is S. 21 deg. 50 min. to S. 36 deg. 50 min. whoſe Complement is 53 deg. 10 min. or 3 Hours 33 Minutes, which ſub-

tracted from 12, gives 8 Hours 27 Minutes, or 27 min. after 8 of the Clock in the Morning, the Time of the Day required.

PROBLEM VI.

Latitude of a Place, Sun's Declination, and his Altitude given; to find his Azimuth, and the Hour of the Day.

The Peformance of this, is as follows;

1. TAKE the Complement of the Latitude, the Complement of the Sun's Altitude, and the Sun's Diſtance from the Pole, (which is his Declination) added to 90 deg. when the Latitude and Declination is one North, the other South; but both being North, or South, it's the Complement of the Declination, and add them together into one Sum.

2. From half that Sum ſubtract (to find the Sun's Azimuth) the Sun's Diſtance from the Pole; but (to find the Hour) ſubtract the Complement of his Altitude; and note the Remainder.

3. To find the Azimuth, you have theſe two Proportions following.

Firſt, As Radius, is to the Sine Complement of the Latitude; ſo is the Sine Complement of the Altitude, to a fourth Sine. Then again,

Secondly, As that fourth Sine, is to the Sine of the half Sum; ſo is the Sine of the Remainder, to a fifth Sine; againſt which, on the Line of Verſed Sines, is the Sun's Azimuth from the North in North Latitude; but from the South in South Latitude.

4. To find the Hour, theſe are the two Proportions which follow.

Firſt, As Radius, is to the Sine Complement of the Latitude; ſo is the Sine of the Sun's Diſtance from the Pole, to a fourth Sine.

Example

Secondly. As that fourth Sine, is to the Sine of the half Sum; ſo is the Sine of the Remainder, to a fifth Sine; againſt which, on the Verſed Sine, is the Hour of the Day from Noon.

Example. In 51 deg. 30 min. North Latitude, the Sun's Declination being 15 deg. 10 min. North, and his Altitude obſerved to be 11 deg. 30 min. I demand his Azimuth, and Hour of the Day?

	d. m.		d. m.		d. m.
	90.00		90.00		90.00
Latitude	51.50	North Declinat.	15.10	Nor. Alt.	11.30
Comp. Lat.	38.30	Sun's diſt. fro Pole	74.50	Com. Alt	78.30
Comp. Alt.	78.30	Comp. Latitude	38 30		
Sun's Diſt.	74.50	Comp. Altitude	78.30		
Sum is	191.50	Sum is - - - -	191.50		
half Sum is	95.55	The half Sum is	95.55		
Remainder	21.05	Remainder is - -	17.25		

Then to find the Azimuth, it's thus:

1. As S. 90d. is to S. 38d. 30m. ſo is Sine 78d. 30m. to Sine 37d. 20m. the fourth Sine.

2. As S. 37d. 20m. is to S. 95d. 55m. ſo is Sine 21d. 05m. to S. 36d. againſt which, on Verſed Sines, is 80d. the Sun's Azimuth from the North Eaſterly, if in the Forenoon; but North Weſterly in the Afternoon.

And to find the Hour of the Day, it's thus:

1. As Sine 90d. is to Sine 38d. 30m. ſo is Sine 74d. 50m. to Sine 37d. the fourth Sine.

2. As Sine 37d. is to Sine 95d. 55m. ſo is Sine 17d. 25m. to Sine 29d. 40m. againſt which, on the Verſed Sines, is 90d. 30m. or 6 Hours 2 Minutes, which is the Hour from Noon; that is, 58 Minutes after Five of the Clock in the Morning; or two Minutes after Six in the Afternoon,

THE

DESCRIPTION and USE of the

SECTOR.

1. THIS uſeful Inſtrument may be of any Length, but it's commonly made one Foot ſix Inches, or two Feet long, to open with a Joint in the Middle like a Carpenter's Rule; one Inch and a half (or more) in Breadth, and of any Thickneſs at Pleaſure, according to the Matter it's made of; which may be either Box-wood, Ivory, Braſs, or Silver.

2. There are two ſorts of Sectors, known by the Names of *Gunter's* and *Forſter's* Sector; and are ſometimes both put on one Inſtrument; that is, *Gunter's* Sector on one Side of it; and *Foſter's* on the other.

3. The Lines on *Gunter's* Sector are theſe, *Line of Lines*, (marked on the End with L) *Line of Sines*, (marked S) *Superficies*, (marked Sup.) *Solids* (marked Sol.) Line of *Metals*, Line of *Equated Bodies*, Line of *Inſcribed Bodies*, &c.

4. The Lines on *Forſter's* Sector are theſe Five, *viz.* *Line of Lines*, or *Equal Parts*, *Chords*, *Sines*, *Tangents*, and *Secants*, each marked at the End with it's Name, or firſt Letter of its Name.

5. All *Sector-Lines* or *Scales*, meet at the Center of the Head (where the Joints is) on the Left-hand, and from thence are figured towards the Right, each being twiee repeated; that is, one on each Leg or Side of the *Sector* anſwering one another.

6. The *Sector* is uſeful in Projection, to reduce, or to make a Scheme to any poſſible Magnitude: Alſo in Proportion, to work any ſtated Canon or Proportion in *Arithmetic*, *Geometry*, *Trigonometry*, *Navigation*, *Aſtronomy*, &c. of which I will give a brief Account, yet ſo as the Learner may be informed how to employ them further.

I. *The Uſe of the* Sector Lines *for Projection.*

IN Projection it's often required to enlarge or diminiſh the Scale, that the Draught deſigned may be of its deſired Magnitude; in doing of which are uſed Lateral and Parallel Diſtances, or Extents of the Compaſſes; and to avoid a needleſs ſaying over the ſame Things, take once for all what's meants by a Lateral, and a Parallel Diſtance, or Extent of the Compaſſes.

1. A *Lateral Diſtance* (in any Line or Scale, is the Extent or Diſtance taken in the ſame Line, on the ſame Side or Leg of the Sector from the beginning thereof, to any Number therein deſired.

As for Example; the Lateral Sine of 30 Degrees is the Diſtance of 30 from the beginning of the Line of Sines; and ſo it is in the Line of Equal Parts, Chords, Tangents, Secants, *&c.*

2. A *Parallel Diſtance* (in any Line, or Scale on the Sector) is the Extent or Diſtance, taken acroſs from any Number in any Line on one Leg of the Sector, to the like Number in the like Line on the other Leg of the Sector.

Or, the neareſt Diſtance from any Number on one Leg (taken acroſs) to the like Number on the like Line on the other Leg of the Sector.

As for Example: The Parallel of Sine of 30 Degrees is (ſuppoſing the Sector opened to any Angle) the Diſtance from 30 in the Line of Sines on one Leg of the Sector, to 30 in the Line of Sines on the other Leg.

Or, the neareſt Diſtance from 30 in the Line of Sines on one Leg, to 30 in the Line of Sines (that is to ſay, the Line iſſuing from the Center of the (Joint or Head) on the other Leg, is the Parallel Sine of 30 Degrees. In like manner it is done in any other Line or Scale.

This being underſtood, the inlarging or diminiſhing any of the Sines; or the finding a Chord, Sine Tangent, or Secant to any propoſed Radius will not be difficult,

difficult; and for the Learner's further Information, take this General Rule.

I. *To find the Chord, Sine, Tangents, and Secants,* &c. *to any Radius (greater or leſſer) propoſed.*

The General Rule is thus;

1. Take the propoſed Radius in the Compaſſes, and make it a Parallel on the Sector in the Radius of any one Line, that is, open the Sector till the propoſed Radius (in the Compaſſes, be a Parallel Chord of 60 Degrees in the Line of Chords; or a Parallel Sine of 90 Degrees in the Line of Sines; or a Parallel Tangent of 45 Degrees in the Line of Tangents; or a Parallel Secant of 0 Degrees in the Line of Secants; for the Chord of 60, Sine of 90, Tangent of 45, and Secant of 0 Degrees are equal, and each equal to Radius.

2. The Sector being kept at that opened Diſtance or Angle, any Parallel Diſtance in any Line, will be a Lateral Diſtance on a like Line to the propoſed Radius; that is, a Parallel Chord of 10, 20, 30, *&c.* is the Chord of 10, 20, 30, *&c.* to the propoſed Radius; alſo a Parallel Sine, Tangent and Secant of 20, 30, 40, *&c.* is the Sine, Tangent and Secant of 20, 30, 40, *&c.* to the foreſaid Radius.

II. *The Uſe of the* Sector *in working Proportions.*

SUppoſing the Learner underſtands how to take a Lateral Diſtance on the Line of Lines (otherwiſe called Equal Parts) on the Chords, Sines, *&c.* And to apply them parallel in any Line on the Sector; the working of any Proportion is thus:

A General Rule to work by the Sector.

1. Take the ſecond Term Lateral (that is, from the beginning of the Line to the propoſed ſecond Term) and opening the Sector, apply that Extent Parallel (that is,

is acroſs it) in the firſt Term: then ſtay the Sector at this Parallel Extent.

2. Take the Parallel Diſtance of the third Term, and meaſure it Laterally, gives the fourth Term ſought, or required.

Or briefer thus: As the Lateral ſecond Term, is to the Parallel firſt Term; ſo is the Parallel third Term to the Lateral fourth Term.

This one Rule is ſufficient for any Proportion whatever, and will appear ſo by a few Examples.

PROB. I. *To multiply by the Line of Lines on the* Sector.

The Proportion is;

AS 1, is to the Multiplier; ſo is the Multiplicand, to the Product.

Example. What's the Product of 8 multiplied by 4?

The Analogy, or Proportion, is this;

As 1, is to 4; ſo is 8, to the Product 32: thus found by the Sector, and general Rule aforeſaid.

1. On the Line of Lines, (that is the Line of Equal Parts) take the ſecond Term 4 Lateral; that is, from the Center of the Joint, and the beginning of the Line, to 4 in the ſame Line.

2. Open the Sector till you fit the (aforeſaid Lateral) Diſtance in the Compaſſes in the Parallel of 1 and 1, or 10 and 10; that is, ſet it over from 10 to 10 at the End of the ſame Line, and now counted for 1 and 1, the firſt Term: keep the Sector juſt at that Angle or Opening.

3. The Parallel Diſtance of the Third Term 8; that is from 8 to 8 taken acroſs from one Leg to the other, in the ſaid Line of Lines, and meaſured Lateral (that is from the beginning of the Line towards the End) reacheth to 32, the fourth Term, which is the product of 8 multiplied by 4. Or ſhorter, thus;

As the ſecond Term 4 (Laterally taken) is to the firſt Term 10 (Parallel ſet) ſo is the third Term (taken Parallel) 8, to the fourth Term (meaſured Laterally) which is 32, the Product as before. Or thus: As the Lateral 8, is to the Parallel 10, counted for 1; ſo is the Parallel 4, to Lateral 32, as above.

PROBLEM II.

To divide by the Line of Lines on the Sector.

The Analogy, or Proportion is thus;

AS the Diviſor is to 1; ſo is the Dividend, to the Quotient. Or thus:

As the Diviſor is to the Dividend; ſo is 1, to the Quotient.

Example 1. How many Square Yards are in 36 Square Feet? *Anſwer*, 4 Square Yards. For it's thus:

As 9, is to 1; ſo is 36, to the Quotient 4: thus to be wrought by the Sector: As Lateral 1, is to Parallel 9; ſo is Parallel 36, to Lateral 4, the Yards required.

PROBLEM III.

To work the Rule of Three by the Line of Lines on the Sector: *or unto three Numbers given, to find a fourth in Geometric Proportion.*

The Analogy is:

AS the firſt Term, is to the ſecond Term; ſo is the third Term, to the fourth Term required.

Example 1. If the Diameter of a Circle be 14 Inches; What is the Circumference? *Anſwer* 44 Inches. For the Proportion is thus:

As 7 is to 22; ſo is the Diameter 14, to 44, the Circumference required; by the Sector thus wrought; As Lateral 22, is to Parallel 7; ſo is Parallel 14, to Lateral 44, the Circumference of a Circle whoſe Diameter is 14.

Example 2. If a Plank or Board be 15 Inches broad, and 20 Feet long; how many Feet are in it? *Anſwer* 25 Feet: For the Proportion is this:

As 12, is to 15 the Breadth: ſo is 20 the Length, to 25 Feet, the Content of the Board: And by the Sector thus to be wrought; as Lateral 15, to Parallel 12, ſo is Parallel 20, to Lateral 25 Feet, the Content of the Plank.

PROB. IV. *The Uſe of the* Sector *in* Plane-Sailing.

Example 1. A Ship in 42d. 10m. North Latitude, ſails NE. by N. 104 Leagues; I demand the Latitude ſhe is in, and her Departure from the Meridian?

The Proportions are theſe;

1. As Radius, to the Diſtance ſailed; ſo is the Sine of the Courſe, to the Departure from the Meridian. That is, by the Sector, thus: As Lateral 104 Leagues (on the Line of Lines) is to Parallel Sine of 90 Degrees; ſo is Parallel Sine of 33 Degrees, 45 Minutes (the Degrees of the Courſe from the Meridian) to Lateral 58 Leagues (on the Line of Lines) the Departure from the Meridian.

Note, If 104 Leagues taken Lateral be troubleſome, to fit Parallel in Sine of 90 Degrees; then take it's half, or quarter Lateral; and the Anſwer will be accordingly its half or quarter: As here, if you take 52, the half of 104 Leagues; the Anſwer will be 29, whoſe double is 58 for the Departure from the Meridian, as before.

2. As Radius is to the Diſtance ſail'd, ſo is Sine Complement of the Courſe, to the Difference of Latitude.

By the Sector *thus:*

As Lateral 104 Leagues, is to Parallel Sine of 90 deg. ſo is Parallel Sine of 56 deg. 15 min. to Lateral 87 Leagues, the Difference of Latitude; by which you may find the Latitude the Ship is in, as before in the Uſe of the *Gunter*, in Pages 208 and 209.

Example 2. *A Ship ſails South Eaſterly, 'till her Difference of Latitude be* 275 *Minutes, and the Departure from the Meridian be* 412 *Minutes; I demand her Courſe and Diſtance ſailed?*

The Proportions are theſe;

1. As the Difference of Latitude, is to the Departure; ſo is Radius, to the Tangent of the Courſe. That is,

By the Sector *thus*;

As Lateral 412 Minutes, is to Parallel 275 Minutes; ſo is Parallel Tangent of 45d. (that being Radius now) to Lateral Tangent of 56d. 15m. the Courſe from the Meridian, which makes SE. by E.

2. As the Sine of the Courſe, is to the Departure; ſo is Radius, to the Diſtance ſailed.

By the Sector *thus*;

As Lateral 412 min. is to Parallel Sine 56 deg. 15 min. ſo is Parallel Sine of 90 deg. (that now being Radius) to Lateral 495 min. the Diſtance ſailed.

After this manner may any Proportion be wrought by the Sector, which I leave for the Learner's Exerciſe.

The Uſe of the following TABLES *of* Latitudes *and* Longitudes.

Latitude and *Longitude* are two primary Affections of the Earth: By the Help of theſe two the Geographer endeavours to repreſent the Parts of the Earth, that they may keep ſymmetry and proportion with the Whole.

Latitude is an Arch of the Meridian, comprehended between the Equator and a Parallel; But Longitude is an Arch of the Equator, intercepted between the Meridian of *London*, in the following Tables, and the Meridian of any other Place.

For the exact ſettling of Latitude, we have many abſolute Helps; but to determine the Longitude of a Meridian and more eſpecially the Longitude of a Place at Sea, in that which hath, and ſtill wearieth the greateſt Maſters of *Geography*.

I have endeavoured to ſettle the Longitude with as much exactneſs as poſſibly I could: For I not only calculated according to the Latitude and Meridian Diſtance of each Place from the Meridian of *London*; which Meridian Diſtance I obtained from the exacteſt *Geographic Charts* extant, but I conſulted with the Reckonings of ſkilful Mariners, and when I found any Difference, I adjuſted it both according to Art and Reaſon.

As for Inſtance: I had from able Mariners, upon their long Experience, the Meridian Diſtance from *Barbadoes* to the *Lizard*: According to which I have ſettled the Longitude of all the eminent Places in the *Weſt-Indies*.

And for the ſettling of the Longitudes of Places in the *Eaſt-Indies*, I conſulted Obſervations of Eclipſes, both Ancient and Modern; as in Page 161 of *Harmonicon Cæleſte*, the Difference of Meridians between *Goa* and *London*, is 5h. 48m. and *Malacca* and *London*, 6h. 49m. My Table hath the former of theſe 5h. 58m. and the latter 6h. 45m. the Difference between my Tables and the former of theſe Obſervations is 10m. and of the latter 4m. which Difference may be born withal.

" If the Reader conſiders the Time, being 1664, with
" the great Labour and Pains (to my Knowledge, being
" then his Servant, the Author beſtowed, and expended
" in compiling this Work, the Performance may juſtly
" be look'd upon as then the beſt of its Kind.

" But ſince that Time there hath been better Helps,
" new Diſcoveries made, and new Places found out; the
" Corrector, at the Requeſt of the Bookſeller, and out of
" Reſpect to the deceaſed Author, but moſt of all for the
" Public Good, hath made ſuch Amendments herein as
" were poſſible, by comparing of the beſt Obſervations,
" Tables, Charts, Maps, and Sea-Journals, he was able to
" procure; ſo that it may be concluded, that theſe Tables are

"the trueſt, or come (in general) neareſt the Truth
"of any extant in our Language; not that they are ſo
"exact in every particular Place, as to need no Amend-
"ment in Time, but with reſpect to the preſent Help
"they are ſo.

"And now I could wiſh that either Authority would
"order, or that all Perſons concerned in conſtructing
"Tables, Charts, and Maps, would mutually unite in a
"fixed Meridian where to begin Longitude.

"For altho' Longitude may be begun at any Meri-
"dian, yet the Convenience of its beginning at one
"Meridian, in all our *Engliſh* Navigation Books and
"Charts, would render the Study and Practice of Na-
"vigation much more pleaſant and eaſy than now it is:
"Such various beginnings and countings of Longitudes,
"occaſion ſome to ſtumble, others to miſtake, and ſome
"to condemn all to be falſe, by not conſidering the
"ſeveral Meridians made uſe of, which ſuch a wiſhed-
"for Union would prevent.

"But this is not likely to be in my Time, who am
"ſo near the Grave; yet ſhould it be ſet on Foot, while
"I am on this Side the other World, my beſt Perform-
"ances ſhould not be wanting to promote it, and ſhould
"count all my ſpare Hours from neceſſary Preparations
"for my laſt End, well ſpent in ſuch a Uſeful and Public
"Good".

Note 1. I do begin the Longitude in my Tables) at the Meridian of *London*, and increaſing it on both Sides the ſaid Meridian; that is to ſay, both Eaſtward and Weſtward, and End in 180 deg. the oppoſite Meridian.

2. Therefore (according to this Account) all Places on the Eaſt-ſide of the Meridian of *London* lie in Eaſt Longitude; and on the contrary, all on the Weſt-ſide of it lie in Weſt Longitude.

3. If a Ship be in Eaſt Longitude, ſailing to the Eaſtward the Longitude increaſeth; but ſailing to the Weſtward the Longitude decreaſeth.

4. And on the contrary, if a Ship be in Weſt Longitude ſailing to the Weſtward, the Longitude increaſeth, and ſailing to the Eaſtward it decreaſeth.

5. Take Notice, that at all Places in Eaſt Longitude, the Sun cometh on their Meridians before he cometh on the Meridian of *London*. As thus: if a Place lie in 15 deg. Eaſt Longitude, the Sun cometh one Hour ſooner to the Meridian there, than he doth to the Meridian of *London*: If in 30 deg. Eaſt Longitude, then two Hours ſooner; If 45 deg. three Hours ſooner; if 60 deg. four Hours ſooner; if 75 deg. five Hours ſooner; if 90 deg. ſix Hours ſooner; if 105 deg. ſeven Hours ſooner; and ſo you may reckon for any other Longitude. But on the contrary, All thoſe Places that lie in Weſt Longitude, the Sun or Star cometh on their Meridians after they are paſt the Meridian of *London*.

To find the Difference of Longitude between any two Places.

IF both Places be in Eaſt Longitude, or both in Weſt Longitude, ſubtract the leſſer Longitude out of the greater, the Remainder is the Difference of Longitude.

If one Place be in Eaſt Longitude, and the other in Weſt Longitude, add both together, and their Sum is the Difference of Longitude, if it exceed not 180 deg. but when the Sum doth exceed 180 deg. ſubtract it from 360 deg. the Remainder is the Difference of Longitude required.

Note, That the Longitudes of Places, tabulated in Mr. COLSON's *Mariner's New Calendar*, heretofore eſtimated from the Meridian of the *Lizard*, are in the laſt Edition of that Book, reduced to the Meridian of *London*.

A TABLE

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A TABLE *containing the chief Harbours, Headlands and Iſlands in the World, ſhewing their Latitude and Longitude: Beginning the ſaid Longitude at the Meridian of* London.

The Sea-Coaſts of *Greenland*.

Names of Places.	Latitude D.	Latitude M.	Longit. D.	Longit. M.
HAcluits Headland	79	55	11	00
Fair Foreland	79	20	10	52
Cape Cold the North End of Charles Iſle	79	00	10	00
Black Point, South End of it	78	00	10	30
Dear Sound	79	15	12	40
Foul Sound	77	28	12	50
Bell Sound	77	15	12	40
Horn Sound	76	45	13	36
Point Lookout	76	25	15	36
Helies Sound	78	55	21	50
Cape Barcan, or Barcam	78	15	22	11
Cape Blanco	77	45	22	30
Ducks Cove } Edges Iſland	77	35	23	10
Negro Point } Edges Iſland	76	55	23	30
Hope Iſland	76	18	23	45
Cherry Iſland, or Bear Iſland	74	30	18	08
Ice Point, or Cape Deſire	77	40	69	10
Admiralties Iſland	75	05	55	50
Langeneſs	74	20	53	36
Croſs Point	72	00	53	12
Fretum Burrough	70	00	61	20
Colgoyen Iſle	69	00	45	00
Cape Candenoſe	69	05	42	35
Cape Barſo	66	30	38	00

North Latitude

Eaſt Longitude

The Coaſts from *Archangel* to the *Naze* of *Norway.*

Names of Places.	Latitude D.	M.	Longit. D.	M.
Archangel	64	30	40	30
Cape Grace, or Cape Bona Fortuna	66	00	36	30
Cape Gallant, or Sweetſnoſe	68	10	34	45
Kilduyn Iſland	69	30	31	20
River Kola Entrance	69	10	31	05
Fiſhers Iſland	70	00	26	38
North Cape	71	23	23	02
Tromſound Iſland	70	25	15	30
Iſland Sanien, South Weſt Point	69	35	13	00
Loeford, Weſt Point	68	15	09	40
Werro, or Weroy Iſland	67	30	07	30
Dronten, or Dronthem	63	40	10	15
Ranſdel	63	15	06	30
North Point	62	20	05	26
Katts Neſs, or Scuts Neſs South Point	61	45	03	36
Hearle Iſland the South End	60	40	03	38
North Bergen	60	10	05	40
Bommel Iſland, North Point	59	25	05	40
Jedder	58	05	06	10
Naze of Norway	57	45	07	24
Maſterland	57	53	11	45

North Latitude.

Eaſt Longitude.

Sea

Sea-Coaſts in the *Sound*.

Names of Places.	Latitude D.	Latitude M.	Longit. D.	Longit. M.
Maerden	58	19	08	57
Caperwick	59	20	10	10
Anſloo or Chriſtiana	59	40	10	00
Gottenberg Gat	57	50	12	15
Cape Kol	56	30	12	13
Elſenburg	56	10	12	30
Valſterborn	55	28	13	00
Chriſtianople	56	10	16	00
Calmer	56	40	16	35
Oeland the South End	56	17	15	30
Oeland the North End	57	20	17	00
Landſort	58	40	18	20
Stockholm	59	20	19	30
Aboo	60	40	21	10
Raſeborg	60	28	22	35
Borgo	60	40	26	00
Pelting Sound	60	32	26	50
Wyburg	60	52	29	16
Peterſburgh	60	00	30	25
Narva	59	27	28	25
Revel	59	27	24	51
Nargin Iſland	59	35	24	30
Sybranneſs in Dagoo, or Dagerort	59	00	23	00
Arenſberg in Oeſel Iſland	58	20	23	32
Parnaw	58	30	25	47
Runen Iſland	57	55	24	00
Ryga	57	04	25	15
Domeneſs	57	30	24	00

North Latitude

Eaſt Longitude

Sea Coaſts in the *Sound.*

Names of Places.	Latitude			Longit.		
	D.	M.		D.	M.	
Der Winda	57	15	North Latitude.	22	06	Eaſt Longitude.
Der Meme,	55	48		21	36	
Coningſburgh	54	43		21	35	
Dantzick	54	22		18	36	
Heel	54	40		19	08	
Gotland, the North End	58	00		20	15	
Faro Sound	58	03		18	50	
Gotland Wiſbuy	57	30		18	30	
Gotland, the South End	57	00		17	45	
Bornholm	55	15		14	45	
Camin, or Hamin	54	10		15	00	
Jaſmond, or Rugen	54	40		14	00	
Roſtock	54	37		18	40	
Straelſund	54	25		13	16	
Wiſmar	54	10		12	00	
Lubeck	54	06		09	55	
Copenhagen	55	41		12	50	
Elſenore	56	22		12	42	
Uraniburg	55	54		12	58	
Anout, or Anholt Iſland	56	50		11	06	
Leſon or Leſnow Iſland, or Jeſou	57	05		10	30	
The Scaw	57	30		10	20	

The Sea Coaſts of *Holland* and *Flanders*, from the *Scaw* to *Calais*.

Holy Land, or Helighland Iſles	54	24	North Latitude	08	35	Eaſt Longitude
Hambrough	53	41		10	35	
Bremen	53	30		09	00	
Emden	53	05		07	35	
Ameland Iſland, or Amoyland	53	30		06	20	
Scheling	53	27		05	58	
The Fly	53	16		05	30	

The Sea-Coaſts of *Holland* and *Flanders,* from the *Scaw* to *Calais.*

Names of Places.	Latitude D.	Latitude M.	Longit D.	Longit M.
	North Latitude		Eaſt Longitude	
The Texel	53	15	05	10
Amſterdam	52	23	05	04
Rotterdam	51	55	04	30
Antwerp	51	10	04	20
The Brill	52	00	04	00
Middleburgh in Zealand	51	37	03	58
Sluys	51	14	03	43
Oſtend	51	14	03	31
Dunkirk	51	02	02	23

The Sea-Coaſts about the Iſland of *Iceland.*

	North Latitude		Weſt Longitude	
Grims Hole, or Geuberman's Rocks	66	23	29	30
Gamar Iſles, or Gille	65	48	26	54
Weſtmania Iſles	63	30	22	54
Rook Point	64	00	26	24
Snow Hill	65	11	27	14
Fair Foreland	66	20	26	27
Rage Point, or Orgal Bay	66	00	25	25
Marza, or Largeneſs	66	08	24	00
Grimſa Iſle	67	15	22	34
Lange Neſs	66	46	12	50
Bargarers Point	66	20	16	35
Silly, or Pappy Iſle	64	50	12	10
Horn Bay	64	50	12	00
Merchants Foreland	63	25	17	05
Portland	64	02	21	05
Greens Iſland	66	50	24	40

The Sea-Coaſts of *Scotland.*

Names of Places.	Latitude			Longit.		
	D.	M.		D.	M.	
Sky Iſland North End	57	45	North Latitude	05	45	Weſt Longitude
Iſland of Lewis. North End	58	20		07	00	
Farro Head, *or* C. Wrath	58	34		05	10	
Shetland South End	60	04		02	00	
Fair Iſle	59	30		02	20	
Iſles of Orkney	59	10		03	22	
Cath Neſs Point	58	40		02	36	
Buchan Neſs	57	45		01	18	
Aberdeen	57	22		01	40	
Dundee	56	28		02	40	
Leith	56	00		02	56	
Edenburgh	55	58		02	59	
Berwick	55	48		01	45	

The Sea Coaſts of *England* from *Berwick* to the *Lizard.*

Newcaſtle	55	12	North Latitude	01	30	Weſt Longit.
Sheiles, or Sheilds	55	02		01	23	
Sunderland	54	55		01	20	
Hartlepool	54	43		00	56	
Whitby	54	26		00	50	
Scarborough	54	20		00	40	
Flamborough Head	54	08		00	11	E. Lon.
Burlington	54	00		00	08	
The Spurn	53	45		00	13	
Hull	53	52		00	20	W
Grimeſby	53	30		00	56	Eaſt Longitude
Boſton	53	10		00	25	
Lynn	52	55		00	32	
Wells	53	10		01	00	
Blackney	53	08		00	55	
Cromer	53	10		01	05	

The Sea Coaſts of *England*, from *Berwick* to the *Lizard*.

Names of Places.	Latitude D.	M.	Longit. D.	M.
Winterton	52	57	01	22
Yarmouth	52	42	01	38
Alborough	52	16	01	28
Orfordneſs	52	12	01	16
Ipſwich	52	10	01	05
Harwich	52	05	01	18
Colcheſter	51	58	00	56
LONDON	51	31	00	00
Rocheſter	51	28	00	26
Maregate	51	27	01	14
The North Foreland	51	27	01	24
Sandwich	51	25	01	14
The Downs	51	23	01	25
The South Foreland	51	10	01	20
Ripraps, a Sand	51	53	01	26
Dover	51	06	01	18
Dongeneſs	50	57	00	51
Rye	51	02	00	45
Beachy	50	46	00	25
Shoram	50	55	00	17
Portſmouth	50	49	01	00
Iſle of Wight, Newport	50	42	01	25
Pool	50	56	01	54
Weymouth	50	42	02	40
Portland	50	30	02	44
Chiddock	50	46	03	00
Lime	50	45	03	15
Topſham	50	38	03	28
The Berry	50	25	03	49
Torbay	50	32	03	39
Dartmouth	50	26	03	38
The Start Point	50	07	03	47

North Latitude

Eaſt Longitude.

Weſt Longitude

The Sea-Coaſts of *England*.

Names of Places.	Latitude D.	M.	Longit. D.	M.
	North Latitude		West Longitude	
The Eddyſtone	50	10	04	24
Plymouth	50	31	04	17
Ramhead	50	16	04	35
Foy	50	24	04	35
Falmouth	50	11	05	10
LIZARD	49	57	05	14

Sea Coaſts from the *Lizard* to *Holy-Head*.

Names of Places.	Latitude D.	M.	Longit. D.	M.
	North Latitude		Weſt Longitude.	
Lands End	50	06	06	00
Gulf	49	56	06	06
Scilly Iſlands, the middle	50	00	06	45
Seven Stones	50	10	06	40
Hartland Point	51	10	04	35
Londey Iſle	51	20	04	40
Mort Bay, or Mort Point	51	12	04	40
Briſtol	51	33	04	35
Swandſey	51	40	04	25
Caldy Iſland	51	33	05	14
Milford	51	45	05	15
St. David's Head	51	00	05	22
Barſey, or Bardſey Iſle	52	44	05	00
Liverpoole	53	20	03	00
Weſtcheſter	53	37	04	20
Lancaſter	54	42	04	36
White Haven	54	17	03	30
Iſle of Man, Weſt End	53	45	05	00
Holy Head	53	24	04	50

The Coaſts of *Ireland*.

Names of Places.	Latitude D.	Latitude M.	Longit. D.	Longit. M.
Fair Foreland	55	05	06	30
London Derry	55	00	07	50
Iſland Torre	55	09	08	30
Iſles of Arran	54	48	08	59
Stags of Broad Haven	54	07	10	06
Iſles or Arian	54	55	09	50
Galway	53	07	09	40
Gall, or Doen's Head	52	40	09	30
Lupis's Head	52	24	10	15
Limrick	52	23	09	35
Blaſques	52	00	11	56
Skillocks	51	30	11	55
Cow and Calf	51	22	10	36
Mizan, or Miſſen Head	51	16	11	30
Old Head of Kinſale	51	35	08	58
Cape Clear	51	17	11	10
Kinſale	51	50	09	40
Cork	51	49	09	30
Waterford	52	09	08	40
Wexford	52	13	07	27
Dublin	53	12	06	56
Lumbay Iſland	53	24	07	30

North Latitude

Weſt Longitude

The Sea Coaſts of *France*.

Names of Places.	Latitude D.	Latitude M.	Longit. D.	Longit. M.
Calais	50	58	01	54
Dieppe	49	56	01	09
St. Vallery	50	10	00	56
Sain Head, Cape de Antifer	49	44	00	34
Rouen Mouth	49	34	00	30
Cape Barfleur	49	43	01	14W
Cape de la Hogue	49	47	02	00W

North Latitude.

Eaſt Longit.

The Coaſt of *France*.

Names of Places.	Latitude D.	Latitude M.	Longit. D.	Longit. M.
Alderney	49	50	02	12
Caſkets	49	50	02	20
Guernſey	49	33	02	40
Jerſey	49	15	02	20
St. Maloes	48	39	01	57
Morlaix	48	33	03	49
Iſland de Baſs	48	50	04	00
Uſhant	48	30	05	02
Conquet	48	27	05	00
Breſt	48	23	04	25
Camarita Bay	48	25	04	28
Seams	48	02	05	00
Weſt Penmark	47	48	04	24
Bell Iſle	47	18	03	16
Nantz	47	14	01	39
Heys Iſle	46	24	02	14
Iſle de Rey the middle	46	10	01	30
Iſles of Oleron	45	56	01	00
Rochel	46	10	01	11
Bourdeaux City	44	50	00	38
St. Sebaſtian	43	24	01	27
Bilboa	43	29	02	58
Cape Pinas	43	56	06	00
Cape Ortegal	44	04	07	48
Cape Corunna, or Groin	43	28	09	20
Cape Finiſtere	43	12	09	40
Iſles of Bajona	42	29	09	27
Oporto	41	10	09	25
Burlings	39	35	09	24
Rock of Liſbon	38	52	09	50
Liſbon	38	42	08	53
Cape St. Vincent	36	53	09	06
Cape St. Maria	36	58	08	30
Cadiz	36	33	06	01

North Latitude.

Weſt Longitude.

The Coaſts on the Main Continent within the *Straits.*

Names of Places.	Latitude			Longit.		
	D.	M.		D.	M.	
Gibralter	36	12		04	53W	
Malaga	36	48		03	50W	
Cape de Gat	36	40		01	40W	
Cape Paul	38	15		00	05 E	
Alicant	38	35		00	15	
Cape St. Martin	38	46		00	40	
Barcelonia	41	26		02	18	
Marſeilles	43	18		05	27	
Toulon	43	07		06	02	
Genoa	44	25		08	43	
Leghorn	43	28		10	35	
Civita Vechia	42	10		12	25	
Rome	41	54	North Latitude	12	45	Eaſt Longitude
Naples	40	51		14	46	
Cape Spartevento	37	55		16	55	
Cape Colonne	38	56		18	05	
Gallipoli	39	56		18	43	
Cape St. Maria, or Lucia	39	45		19	00	
Ancona	43	40		14	26	
Venetia, or Venice	45	25		12	10	
Zara	44	30		16	35	
Raguſa	42	55		18	50	
Cattaro	42	47		19	17	
La Valona	40	45		20	05	
Point Palerma	40	00		20	15	
Lepanto	38	10		22	52	
Cape Matapan, or Caliga	36	33		22	41	
Cape St. Angelo, or Angulo	36	32		23	56	
Athens	37	58		24	05	

The Coaſts on the Main Continent within the *Straits*.

Names of Places.	Latitude North Latitude		Longit. Eaſt Longitude	
	D.	M.	D.	M.
Cape Martelo South Point of Negropont	38	07	25	03
Cape Colom, or Collonne	37	45	24	42
Salonica	40	41	23	13
Cape Monte Sancto	40	26	25	02
Gallippoli	40	33	27	20
Conſtantinople	40	59	28	56
Cape Barbador, or Baba	39	30	26	30
Smyrna	38	28	27	25
Cape Barbernola, or Blane	38	09	26	32
Epheſus	38	01	27	53
Antiochetta	36	30	32	46
Scanderoon, or Alexandretta	36	34	36	30
Antiocha	36	11	36	25
Aleppo	35	42	37	24
Tortoſa	35	00	36	30
Tripoli	34	38	36	15
Joppa, or Jaffa	32	27	35	20
Jeruſalem	31	51	35	22
Alexandria	31	10	30	19
Cape Ruſato	32	48	21	25
Cape Meſurato	32	21	16	17
Tripoly	32	54	13	10
Suſa	35	53	10	34
Cape Bona	37	03	11	04
Tunis	36	50	10	17
Bona	36	52	08	19
Seven Capes	37	15	07	00
Gigeri	37	14	06	15
Cape Tidelles, or Dellys	37	15	04	18
Algier	36	50	03	16
Cape Tenes	36	45	01	50
Orain	36	02	00	26
Cape Tres Forcas	35	30	02	04W
Ceuta	35	54	04	45W
Tangier	35	42	05	22W

Iſlands within the *Straits.*

Names of Places.		Latitude		Longit.	
		D.	M.	D.	M.
Formentura		38	33	01	55
Ivica		38	50	01	40
Majorca		39	30	03	03
Minorca		39	51	04	52
C. Tolare, South	End of Sardinia	38	46	09	12
C.S. Reparade N.		41	10	09	50
Aſinaria		41	03	09	08
Bonifacio, South	End of Corſica	41	24	09	46
C. Corſo, North		42	56	09	50
Caprai, or Captia		43	03	10	17
Lilboa, or Elba		42	45	11	00
Planoſa		42	30	10	45
M. Chriſto		42	17	11	00
Palmarolla, or Palmeria		41	03	13	35
Ponſa		41	00	13	37
Iſcia, or Eſchia		40	54	14	30
Strombello		38	58	16	00
Volcanello		38	27	15	33
Fellicur		38	30	15	00
Allicur		38	28	14	42
Uſtica		38	36	13	52
Trapano Weſt End of	Sicily	37	57	13	13
Palermo in		38	06	13	50
C. Paſſaro Eaſt End of		36	38	15	40
Meſſina in		38	07	16	20
Siracuſa in		37	03	15	45
C. Molin in		37	42	15	56
Pantalaria		36	48	12	20
Limoſa		35	56	13	11
Lampidoſa		35	34	12	46
Malta		35	53	14	32
Ouvre l'oeil, a Rock		35	45	16	36
Grande, or I. Longo		44	25	16	18

North Latitude

Eaſt Longitude

Iſlands within the *Straits.*

Names of Places.	Latitude D.	M.		Longit. D.	M.	
Poma	43	10	North Latitude	16	08	Eaſt Longitude.
St. Andrea	43	12		16	26	
Liſſa	43	06		16	40	
Agoſta	42	58		17	20	
Corzola	43	03		17	32	
Melada	42	52		18	06	
Corfu	39	42		20	06	
Cephalonia	38	15		21	00	
Zante	37	46		21	14	
Sapienſa	36	40		21	45	

Iſlands in the *Archipelago.*

Names of Places.	Latitude D.	M.		Longit. D.	M.	
Taſſo	40	40	North Latitude.	25	17	Eaſt Longitude.
Lemnos	39	59		25	37	
Metyline { Cape Sygre	39	15		26	05	
P. Olivia	38	57		27	00	
Siatto, or Schate	39	22		23	58	
Scio, or Xio	38	22		26	12	
Patmos	37	20		26	55	
Tino	37	35		25	36	
Zio, or Sea	37	37		24	50	
Ferminia, Fermina, or Termie	37	24		24	58	
Serfante, or Sifanto	36	58		25	20	
Millo, Mila, or Melo	36	40		25	00	
W. } end of Candia { Cape St. John	35	15		24	00	
E. Cape Solomon	35	00		27	08	
Rhodes { North End	36	27		28	38	
South End Cape Tranquill	36	01		28	28	
S.W. } end of Cyprus { C. Baſſa	34	57		32	23	
Eaſt C. St. Andrea	35	31		35	00	
South C de Gatte	34	30		33	10	

Sea Coaſt of *Barbary* and *Guiney*, from *Tangier* to Cape *Bona Eſperance.*

Names of Places.	Latitude			Longit.		
	D.	M.		D.	M.	
Cape Spartel	35	50	North Latitude	05	49	Weſt Longitude
Salle	33	51		06	25	
Cape Cantin	32	36		09	10	
Cape de Geer	30	27		10	06	
Cape de Non	28	15		11	04	
Cape Bajadore	26	04		15	35	
Cape Blanco	20	32		17	35	
Cape de Verde	14	43		17	20	
River of Gambia's Entrance	13	08		15	31	
Cape Roxo	11	50		15	04	
Cape de Monte, or Mount	06	23		12	00	
River Seſter, or Seſtos	05	24		08	36	
Cape de Palmas	04	13		06	45	
River St. Andrea	05	05		04	15	
Cape Three Points	04	28		01	50	
Cape Corſe	04	55		02	00	Eaſt Longitude
River de Volta, or Accara	05	55		03	25	
Cape Formoſa	04	15		06	40	
New Calabar Entrance	04	42		08	33	
Old Calabar Entrance	04	10		09	45	
River de Camarones	03	25		10	10	
Iſland Fernand Poo	02	40		10	30	
Iſland de Prince, or Prince's	01	40		09	15	
River de Anger, or Angra	00	50		10	01	
Iſland St. Thomas	00	00		08	20	
Iſland St. Matthew's	01	30	South Latitude	06	01	W
Iſland Aſcenſion	07	40		14	05	W
Iſland Anabona	02	10		07	27	E
Cape Lopas	00	55		09	55	E
Cape Negro	16	08		12	31	E
Iſland St. Helena Nova	16	00		06	04	E
Iſland St. Helena	15	56		04	10	[illegible]
River Congo	05	40		15	25	E
Cape St. Thomas	34	10		14	43	E

Sea Coaſt of *Barbary* and *Guiney*, from *Tangier* to Cape *Bona Eſperance*.

Names of Places.	Latitude			Longit.		
	D.	M.		D.	M.	
Cape Secos, Sego, or Seca	29	00	S. Lat.	15	56	E
Cape Bona Eſperance	34	07		18	40	E
Cape Aguilhas, or Lagullas	34	54		21	20	E
Iſland Triſtian de Acunha	37	05		13	50	W

The Sea Coaſt of *Barzille*.

Iſland St. Paul	01	20		25	30	
Para River	02	50		42	47	
Cape St. Roque	05	00		35	47	
Rio Grande	05	20		35	57	
Permanbuco	07	48		35	30	
Cape St. Auguſtin	08	35		35	20	
Iſland Ferdinando Lorenha	03	50		31	10	
River St. Franciſco	10	50		37	50	
Bay de Todos Sanctos	12	46	South Latitude	41	00	Weſt Longitude
Port Segura	16	31		40	35	
Cape de Abrolhos	18	15		41	07	
Spirito Sancto	19	59		42	10	
Cape St. Thomas	22	10		42	15	
Cape Frio	23	00		42	20	
Iſland St. Catherina	27	50		49	00	
River Grande's Entrance	31	55		52	00	
Cape St. Maria	34	30		56	40	
River de la Plata, or Cape St. Antonio	35	40		57	36	
Cape de St. Andreas	38	40		63	05	
Bay Sinfunda, or Sinfendo	42	35		68	00	
Point de los Leones	44	00		70	40	
River Camerones	45	30		73	00	
Cape Blanco	46	50		72	07	
Pepy's Iſle	47	20		66	40	
Point of River St. Julian	48	40		74	34	
Cape Virgin Mary of Magel. Straits	52	00		75	05	
La Maire Straits	54	34		73	01	

The Sea Coaſts of *Brazille.*

Names of Places.	Latitude D.	M.		Longitude D.	M.	
C. Horn, the S. part of Terra del Fuego	57	30	South Latitude	79	55	West Longitude
Iſland dos Picos	22	30		25	15	
Iſland de Martinvas	19	30		26	55	
Iſland St. Maria de Agoſta	19	40		29	10	
Iſland Trinidada	20	30		30	00	
Iſland Aſcenſion	07	40		14	05	

The Coaſts on the Main Continent in the *Eaſt-Indies.*

Bay de Allogoor Daliagoa	25	30	South Latitude	31	05	East Longitude
River St. Lucia	28	20		32	17	
Cape St. Martin, or Maria	22	40		35	05	
Cape Corientes	23	40		36	17	
Moſambique	15	04		41	10	
P. de Aguada, or Del Gada	10	17		40	10	
Cape de Falſo	09	00		39	20	
Tongon	04	50		38	59	
Mombaſo	03	50		38	30	
Molinde, or Melinde	02	58		39	35	
River Lamos	01	20		40	13	
Magadoxa	02	20	North Latitude	44	50	
Cape de Baſſas, or Boxos	04	06		47	38	
Cape de Gardeſoy	11	44		51	20	
Aden	13	00		47	00	
Mocha	14	10		44	50	
Cape Matriaca	15	23		52	10	
Defar	17	00		55	35	
Cape Reſulgat	22	41		59	45	
Muſcat	23	32		59	45	
Baſſora, or Buſero	29	45		49	20	
Gumbaroon	27	20		56	40	
Cape Glado	25	50		63	34	

The Sea Coaſts on the Main Continent in the *Eaſt-Indies.*

Names of Places.	Latitude D.	Latitude M.	Longit. D.	Longit. M.
River de Sinda, or Cinde	24	45	67	35
Diu Head	21	02	69	50
Surat	21	10	72	25
Deman	20	06	73	30
Bombay Iſland	19	18	73	06
St. John's	19	55	73	20
Chaule, or Choale	18	31	73	37
Dabul	18	03	74	00
Rajapour Iſle	17	02	74	10
Goa	15	31	73	50
Carwar	14	47	75	00
Manquelore	12	53	75	25
Tellecherry	11	42	75	25
Callecut	11	16	75	30
Cannanou	10	22	75	35
Cochin	09	54	75	55
Anjanga	08	29	76	25
Cape Comarin	07	50	77	25
Colombo in Zeylone	07	07	79	30
Point de Galle, or Gallo on the ſame	06	10	80	10
Dundre Head on the ſame	06	02	80	45
Trinconomale	08	40	81	40
Great Baſſas Shoals	06	23	81	45
Jetrapatam	09	50	80	10
Negrapatam	11	01	79	55
Trincumbar	11	15	79	50
Porta Nova	11	45	79	44
Pondicherry	11	54	80	18
Fort St. David, or Tregapatam	12	05	79	48
Conymere	12	35	80	05
Fort St. George, or Madraſſapatam	13	11	80	32
Pullicat	13	30	80	22
Armegon	14	16	80	12
Petapoly	16	06	80	42
Due point, or Mecha	16	08	81	32
Maſulapatam	16	22	81	10

North Latitude.

Eaſt Longitude.

The Sea-Coaſts on the Main Continent in the *Eaſt-Indies.*

Names of Places.	Latitude			Longit.		
	D.	M.		D.	M.	
Maſſipore	16	30	North Latitude	81	57	Eaſt Longitude
Viſagapatam	17	43		83	57	
Birmlapatam	17	51		84	09	
Pondy	18	49		85	15	
Jacarnaut Pagod	19	51		86	42	
Arſepure	29	11		87	23	
Point Palmiras	20	42		87	52	
Balaſore Road	21	16		87	48	
Piply	21	25		87	57	
Hughly	23	09		89	05	
Dacca	23	57		90	55	
Caſimbazar	25	06		88	45	
River Bengal	22	17		92	21	
River Aracan	20	10		93	40	
Pegu	18	35		96	20	
Melacca	02	12		102	10	
Formoſa	02	05		101	30	
Point Romania	01	16		103	15	
Point Cui	12	10		99	02	
Siam Entrance	14	18		100	55	
Cambodia Entrance	10	28		105	00	
Cape Anarilla, or Avarilla	13	25		108	03	
Cochin, or Chinchen	14	05		107	56	
Tonquin	20	50		105	40	
Canton	23	14		113	06	
Amoye Iſland	24	35		116	50	
Hockſew	26	30		118	20	
River Swadia	27	51		118	50	
Liampo, Lingpo, or Ningpo	29	59		120	35	
Iſland Chuſan	30	00		120	35	
Nanquin	33	07		120	01	
Pekin	39	54		116	28	

Iſlands in the *Eaſt-Indies.*

St. Paul	38	20	S. Lat.	75	25	E. Long.
Romeras de Caſtelamas	28	45		67	17	
St. Joan de Liſbon	25	24		53	30	
Diegen Reys	19	50		19	61	

Iſlands in the *Eaſt-Indies.*

Names of Places.	Latitude D.	Latitude M.	Longit. D.	Longit. M.
St. Brandon	16	38	64	30
Mauritius	20	10	52	55
Malha	11	15	60	30
C. St. Mary S. } End of St. Laurence	25	47	46	10
D D' Ambre N.	12	10	51	05
St. John de Nova	17	21	43	20
St. Chriſtova	17	36	43	40
Mayetto	13	10	45	38
Joanna	12	10	45	03
Mohilla	12	05	44	23
Comero or Angazecha	11	40	43	50
Morſia, or Monſia	08	07	40	15
Zanzebar	06	48	39	57
Penda	05	20	39	35
Comero	10	30	44	39
Coſmeledo	10	14	51	17
Juan de Nova	09	30	52	40
Aſtore Iſle	09	55	53	50
Agalega, or Gallega	09	47	54	31
Setta Hermanes	02	47	59	13
Quevelo, Quebello	03	53	52	36
Baſſas de Banhas	05	05	48	46
Hermanos	03	32	54	45
Iſland Gratio	06	10	63	01
Padra Banhas	02	10	65	32
Baſſas de Chages, or Iſland de Chagos	06	55	68	45
Three Germans	04	30	62	43
Croſs Iſland	04	10	58	05
Sacatora, or Zacatora	12	21 N	54	05
Iſland Abdeleur	12	04 N	53	04
Cubello	08	10 N	71	45
Malique	09	00 N	72	58
Garipe, or Gripe	10	40 N	72	37

South Latitude

Eaſt Longitude

Iſlands in the *Eaſt-Indies.*

Names of Places.	Latitude D.	Latitude M.		Longit. D.	Longit. M.	
Qualpena	10	00	North Latitude	73	30	Eaſt Longitude.
Andomaon, or Antada	11	10		73	32	
Ceylone South End, C. Gallo	06	08		81	15	
Maldiviæ South Part	00	25		76	22	
North Part	07	14		73	04	
Yas de Diego Reys	00	20		72	00	
Manila	14	25		117	06	
Aynian N.W. Point	19	30		107	00	
N.E. Point	19	55		109	55	
Japan S.E. Point	35	30		140	30	
S.W. Point	35	00		128	30	
Cocos	04	10		91	02	
Andaman the middle	12	35		93	19	
Borneo	04	50		110	55	
Nicobar	07	11		93	40	
North Weſt End of Sumatra	05	22		94	50	
Bencola	03	55	S	104	08	
South Eaſt End of Sumatra	05	22	S	105	10	
Jambe	01	19	S	102	55	
Bantam	06	11	S	105	55	
Batavia	06	16	S	106	46	

The Southern Iſlands, or Cape de Verde Iſlands.

St. Antonio	17	35	North Latitude.	24	40	Weſt Longitude.
St. Vincent	17	15		24	25	
St. Lucia, or Round Iſland	17	07		24	20	
St. Nicholas	17	00		23	38	
Iſle de Sal	16	55		21	56	
Bonaviſta	16	05		22	08	
Mayo, or Iſland May	15	14		22	08	
St. Jago	15	08		22	45	
Fuego, or Fulgo	14	50		23	35	
Brava's	14	28		23	54	
St. Paul	01	20		25	30	

The *Canary* Iſlands.

Names of Places.	Latitude D.	Latitude M.		Longit. D.	Longit. M.	
Sancto Porto	32	58	North Latitude	15	54	Weſt Longitude
Maderia Weſt End	32	23		17	26	
Salvagas	30	00		16	50	
Palma	28	40		17	36	
Ferro	27	54		17	45	
Gomero	28	06		17	05	
Pico Tenariff	28	23		16	28	
Grand Canaria	27	52		15	10	
Allegranſa	29	20		12	33	
Lancerota	29	02		13	45	
Forteventura South Weſt End	28	05		12	36	
The Weſtern Iſlands.						
Corvo	39	54	North Latitude	30	55	Weſt Longitude
Flores	39	32		30	54	
Fyal	38	53		28	15	
Pico	38	40		27	20	
St. George	38	52		26	03	
Tercera	38	57		25	34	
Gratioſa	39	16		27	01	
Whale Fiſh	39	37		25	11	
Vajo, or Vegia	38	43		23	48	
St. Michael	38	06		23	36	
Formigas, or Hormigas	37	40		22	47	
St. Maria	36	59		23	38	
The Sea Coaſts of the North Part of *America*, *Hudſon's Bay* and *Newfoundland*.						
Cape Farewell	59	45	North Latitude	40	45	Weſt Longitude
Cape Elizabeth	62	03		66	50	
Iſland Reſolution	61	50		65	04	
Queen Ann's Foreland	63	48		74	45	
Salvages Iſland	62	40		70	17	
Saliſbury Iſland	63	45		77	15	
Mill's Iſle	64	26		80	18	
Nottingham Iſle	63	30		79	53	

The Sea-Coaſts of the North Part of *America, Hudſon's-Bay* and *Newfoundland.*

Names of Places.	Latitude		Longit.	
	D.	M.	D.	M.
Shark Point	64	30	82	55
Cape Southampton	61	55	86	48
Sir Thomas Roe's Welcome	64	15	92	04
Cape Churchill	59	00	95	20
Port Nelſon, or York Fort	57	10	93	58
New Severn	56	00	88	20
Cape Heneretta Maria	55	07	84	30
Viner's Iſle	53	05	84	03
Albany Fort	52	26	84	50
Mouſe River's Mouth	51	18	83	13
Point Comfort	51	24	81	11
Frenchman's River	51	20	80	14
Rupert's River	51	30	79	26
Charlton's Iſland	52	08	81	20
Danby's Iſland	52	15	80	56
Shepherd's Iſland	51	45	80	48
Solomon's Temple Iſland	53	05	81	00
Weſton's Iſle	52	58	82	48
Cubbs Iſle	54	10	82	40
Bear's Iſland	54	25	83	45
Baker's Dozen's Iſles	57	56	81	25
Sleeper's Iſles	60	10	81	30
Mansfield Iſle, the middle	61	42	80	30
Cape Jones	54	55	78	58
Cape Walſingham	62	35	77	55
Cape Charles	62	10	75	35
Button's Iſles	60	25	66	27
Bell Iſland	52	07	55	35
Grey's Iſlands	50	35	53	25
Cape St. John	50	25	52	48
Pengwin Iſland	50	00	52	50
Cape Bonaviſta	49	15	52	12

North Latitude

Weſt Longitude

The Sea-Coaſts of *Hudſon's-Bay*, *Newfoundland*, and *New-England*.

Names of Places.	Latitude		Longit.	
	D.	M.	D.	M.
Trinity Bay Entrance	48	52	52	20
Barcaleau Iſland	48	40	51	56
Conception Bay Entrance	48	20	52	08
Cape St. Francis	48	09	51	46
Cape Race	46	40	51	52
Bay of Bulls	47	50	51	29
St. John's Harbour	48	00	51	39
Cape St Maria	47	10	53	23
Placentia Bay	47	45	53	58
Cape St. Laurenſa	47	30	54	23
Iſland St. Paul	47	10	58	18
Cape Roye	48	00	57	40
Virgin Rocks	46	06	51	07
French Factory	50	10	61	10
Bay of Breſt	52	10	56	57
Tadouſack	49	00	67	05
Quebeck	46	55	69	48
Anti Coſti Iſland, the middle	49	40	60	45
Cape St. Charles, or Charles Straits	52	10	55	00
Cape Britain	46	00	58	30
Cape Sable	43	50	64	58
Point, or Port Royal	44	45	65	40
Penobſcut River	44	40	67	10
North Yarmouth	44	14	67	58
Paſcataway Entrance	43	26	70	10
Cape Ann Iſland	42	46	69	45
Cape Codd	42	12	68	55
Boſton Entrance	42	30	69	23
Plymouth	42	02	68	50
South of St. George's Bank	41	45	67	15
South End of Nantuket Shoals	39	50	68	23
Nantucket Iſland	41	15	68	48
Martha's Vineyard	41	14	69	09

North Latitude

Weſt Longitude

Sea Coaſts on the Main Continent in the *Weſt-Indies.*

Names of Places.	Latitude		Longit.	
	D.	M.	D.	M.
Elizabeth's Iſland	41	35	69	13
Block Iſland	41	15	69	58
Montock Point	41	18	70	20
Fiſher's Iſland	41	20	70	40
New York	40	58	73	53
Sandy Hook	40	25	73	54
Cape James, or Henlopen	38	50	74	56
Long Iſland, the middle	40	50	72	45
Cape May	39	06	73	39
Cape Charles	37	16	74	16
Cape Henry	37	00	75	24
Cape Hatteras	35	15	74	20
Cape Feare	33	58	76	54
Cape Roman, or Cattit	33	27	77	50
Aſhly River, or Charles Town	33	05	78	46
Port Royal	32	00	79	43
Bay of St. Auguſtine	30	10	80	43
Cape Florida	24	57	80	30
Laphillapina or Apalachia	29	47	84	44
River Spiritus Sanctus, or Miſchiſippi River's Mouth	28	54	96	50
Tompeck	22	20	100	15
Liva, or Vera Cruz	19	12	97	48
Sierra, or Cape de Martin	19	10	95	45
Triſte, or Trieſt Iſland	18	10	91	20
Campecha	19	30	92	10
Cape Condeſedo	20	40	89	40
Cape Catocha	21	10	86	10
Salamancha	16	50	89	10
Cape Honduras	16	25	84	45
Cape Camaron	16	10	83	30

North Latitude.

Weſt Longitude.

The Coaſts on the Main Continent in the *Weſt-Indies.*

Names of Places.	Latitude D.	Latitude M.	Longit. D.	Longit. M.
Entrance of Nicaragua	11	25	84	15
Porto Bello	09	33	79	45
Darien, or Scotch Settlement	08	30	78	45
Cartagena	10	28	75	21
Cape Conquiquaco, or Coquibaco	12	40	70	42
Iſland Curaſoa, or Quicaſao	12	10	68	15
Iſland Margaritta	11	20	63	20
Iſland Trindada	10	15	60	17
Mouth of Oronoque River	08	15	59	25
Cape Three Points	10	30	62	10
Cape Naſſau	08	05	57	55
N. Cape, the middle of Caopory Iſland	02	05	49	56
Suranam	06	25	56	50
Cape Orange	04	25	51	25
Mouth Amazones River	00	00	49	56

North Latitude

Weſt Longitude

Iſlands in the *Weſt-Indies.*

Tobago Weſt End	11	10	59	10
Barbadoes, at Bridge Town	12	58	58	50
Granado	11	57	60	20
Granadillos	12	20	59	55
Boquia	12	50	59	53
St. Vincent	13	12	60	12
St. Lucia	13	55	60	04
Martinica	14	43	60	54
Dominica	15	23	60	30
Marigallanta	15	58	60	20
Guardalupa	16	10	61	15
Deſſeada	16	20	60	10
Antegua	17	05	61	45
Barbuda	17	56	60	40
Monſerat	16	45	62	15
Rodondo	16	55	61	15

North Latitude

Weſt Longitude

Iſlands in the *Weſt-Indies.*

Names of Places.	Latitude		Longit.	
	D.	M.	D.	M.
Nevis	17	05	62	32
St. Chriſtopher's	17	17	62	40
Euſtatia	17	25	62	20
Saba	17	35	62	40
St. Bartholomew	17	52	62	06
St. Martin's	18	06	62	10
Anguilla	18	17	62	13
Sambrero	18	35	62	30
Anegada	18	47	62	46
St. Cruize	17	52	63	30
Virgins	18	30	63	25
St. Thomas	18	30	63	22
St. John de Port Rico	18	30	65	37
Iſlands and Rocks of Aves	12	01	64	30
Tortuga, or Tortugas	11	10	63	54
Margaritta	11	20	63	20
Blanco	11	50	63	40
Teſtigos	11	35	62	41
D' Orchila	11	45	64	30
Bonairy, or Bonaire	12	12	66	28
Aruba	12	50	68	28
Eaſt End of Hiſpaniola	18	18	69	15
Weſt End of the ſame	18	26	74	36
Eaſt End of Jamaica	18	00	75	50
Port Royal in Jamaica	17	40	76	32
Weſt End of the ſame	18	08	79	00
Eaſt End of Cuba	20	15	73	55
Havanna	22	40	82	55
Weſt End of Cuba	21	40	86	30
La Bermudas	32	25	63	40
Bahama Iſland	26	50	79	16
Abaco South End	26	00	73	46
Andrews, or Androſs, or North End	25	10	78	40
Providence	25	00	77	20

North Latitude

Weſt Longitude

Iſlands in the *Weſt-Indies.*

Names of Places.	Latitude		Longit.	
	D.	M.	D.	M.
		North Latitude		Weſt Longitude
Harbour Iſland	25	37	76	47
Eleuthera South End, or Hathern	24	40	75	56
Cat Iſland, the middle	24	25	75	09
Watling's Iſland	24	03	74	35
Rum Key	23	45	74	50
Exuma	23	22	75	55
Crooked Iſland, North End	22	56	74	12
Long Iſland, South End	22	41	74	52
Atwood's Keys	23	10	73	35
Mayaguana	22	35	72	46
French Keys	22	40	73	40
Merapervouz	21	58	74	45
Hogſties	21	17	73	55
Hineago, Weſt End	20	25	73	49
Weſt Caicos	21	38	71	58
Turks Iſland	21	35	70	08
Abrolho Bank, the North End	21	35	69	06
Plate Rack	20	10	68	15
Mucares	21	30	76	35
Verd	21	17	76	16
Cajad Zal	23	10	79	24
Pinos	21	20	84	20
Great Camains	18	54	81	29
Little Camains	19	30	80	24
St. Andreo	12	23	80	17
Caimanuback	19	08	80	11
Pedro Shoals, North Side	17	10	77	56
St. Milan	17	10	81	28
Guayna	16	53	88	30
Cozumelli	19	30	89	05
Zuna Quita	17	01	89	48

BRITISH MUSEUM 15 SEP 69

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